(The) Indian ~~Pharmacopoeial~~ Pharmacopoeial List - 1946.
Prepared by ~~the~~ a Board of Scholars headed by Col. R.N. Chopra.
Calcutta, 1946.

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THE

INDIAN PHARMACOPŒIAL LIST

1946

GOVERNMENT OF INDIA
DEPARTMENT OF HEALTH

THE INDIAN PHARMACOPŒIAL LIST 1946



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PREFACE

In 1944 the Government of India asked the Drugs Technical Advisory Board to prepare the material for a list of drugs in use in India which, although not included in the British Pharmacopœia, are of sufficient medicinal value to justify their inclusion in an official pharmacopœia and to recommend what standards should be prescribed to secure uniformity and what tests should be used to establish identity and purity. With the approval of the Government of India the following Committee was appointed for the preparation of the List :—

Chairman : Col. Sir R. N. Chopra, C.I.E., M.A., M.D., Sc.D. (Cantab.), F.R.C.P.(Lond.), M.P.S. Hon.(Lond.), I.M.S. (Retd.).

Members :

1. Dr. P. Kutumbiah, B.A., M.D.(Mad.), M.R.C.P.(Lond.), Professor of Medicine, Andhra Medical College, Vizagapatam, and Member, Drugs Technical Advisory Board.
2. Dr. B. N. Prasad, M.Sc., M.B., D.T.M., Ph.D., Professor of Pharmacology, Prince of Wales Medical College, Patna, and Member, Drugs Technical Advisory Board.
3. Dr. B. B. Dikshit, M.B.B.S.(Bom.), D.P.H.(Cal.), M.R.C.P., Ph.D.(Edin.), Haffkine Institute, Bombay.
4. Dr. A. K. Sen, M.B., Member, Drugs Technical Advisory Board.
5. Mr. S. N. Bal, B.S.(Phar.), Ph.C., M.S.(Mich.), Botanical Survey of India.
6. Mr. M. L. Schroff, A.B.(Cornell), M.S.(Mass.), Member, Drugs Technical Advisory Board.
7. Dr. Sudhamoy Ghosh, M.B.E., D.Sc., F.R.I.C., F.N.I., Professor of Chemistry, School of Tropical Medicine, Calcutta.
8. Dr. B. N. Ghosh, M.B.E., F.R.F.P.S., F.R.S.E., Professor of Pharmacology, Carmichael Medical College, Calcutta.

9. Dr. B. Mukerji, D.Sc., M.D., F.N.I., Director, Bio-Chemical Standardisation Laboratory.

10. Secretary, Drugs Technical Advisory Board—Secretary; (Mr. A. F. MacCulloch, O.B.E., M.A., B.Sc., F.R.I.C., Chief Advisory Chemist, Office of the Director-General, Indian Medical Service).

The Government of India have approved the list prepared by the Committee as amended by the Board, with the exception of monographs on cholera vaccine and anti-venene (naja and vipera), and have directed that the list should be published under the name of the Indian Pharmacopœial List, 1946.

GENERAL NOTICES

In addition to the following, all the provisions occurring under General Notices and Appendices to B.P. 1932, including its Addenda (I-VII, 1936 to 1945), should be considered to apply to the Monographs included in the Indian Pharmacopœial List.

(1) *Indian Names.* Representative Indian names current in different provinces have been included as far as possible. It is hoped that this will help considerably in popularising and identifying the drugs.

(2) *Temperature.* All temperatures are expressed in degree Centigrade at normal atmospheric pressure unless otherwise stated. In many cases a uniform temperature, for measuring the various standards, *e.g.*, solubility, specific gravity, etc., could not be maintained for want of reliable data. It is hoped that in future all such values will be determined at 25°C which is practically more convenient than the standard temperature at present adopted in the B. P.

(3) *Reagents and Solutions.* The names of all substances printed in italics in the following monographs refer to materials and solutions used in text, and are described in Appendices to the British Pharmacopœia including the Addenda, or in the Appendices to these monographs.

(4) *Tests for Identity.* Qualitative tests for basic and acid radicals, not specifically described in the text, may be found in the Appendices to the British Pharmacopœia and its Addenda.

(5) *Quantitative Tests for Lead and Arsenic.* Unless otherwise stated in the monographs, tests for Lead and Arsenic are to be done in accordance with the method described in the Appendices to the British Pharmacopœia.

(6) *Physical and Chemical Constants.* In determining the Physical and Chemical Constants the methods recommended in the text of the monographs or in the appendices are to be used. In many cases the range of these constants and the ideal temperature for the determination of the refractive indices for fats, oils, etc., could not be given for want of data. In such cases a reasonable variation will be permissible.

(7) *Vegetable and Animal Drugs.* It is not always possible to obtain vegetable drugs in a state of absolute purity, and a limited amount of innocuous, extraneous or foreign matter adhering to the drug or admixed with it is usually not detrimental. The presence of any poisonous, dangerous or noxious foreign substance, however, is not permissible.

(8) *Assays and Tests.* Where appropriate quantities to be used are not specified, the worker will exercise his discretion consistent with economy and ready reproducibility.

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CLASSIFIED LIST OF CONTENTS

(1) Substances included in the British Pharmacopœia.

(2) Substances not included in the British Pharmacopœia.

(a) Drugs of Plant Origin.

(b) Drugs of Animal Origin and Biological Products, etc.

(c) Biological Products.

PRECAUTIONARY LEGAL NOTICE

In some parts of India there are local laws dealing with certain of the substances which are the subject of the monographs which follow. Wherever this state of circumstances is believed to exist, a caution has been prefixed to the monograph, but it must not be assumed that where no caution appears the subject of the monograph is free from legal restrictions.

It is expedient that local enquiry be made in each case in order to ensure that the provisions of any local law are being complied with.

In general, the Drugs Act, 1940, the Dangerous Drugs Act, 1930, and the Poisons Act, 1919, and the Rules framed thereunder should be consulted.

MONOGRAPHS

ACACIA

[Acac.]

Acacia

Synonym. Indian Acacia.

Indian names. Bengali—*Babla gond*; Hindi—*Babul or Kikar gond.*

Acacia is the dried gummy exudation from the stem and branches of *Acacia arabica* Willd., and of closely allied species of *Acacia* (Fam. *Mimosaceæ*).

Characters. Irregular and broken tears of varying size, brown or red to light straw colour; numerous minute fissures, brittle fractured surface, glossy and occasionally iridescent. Odourless; taste, bland and mucilaginous. Powder, brown or light straw colour, angular, microscopic fragments with but slight traces of starch or vegetable tissue present.

Almost entirely soluble in twice its weight of *water* yielding a very viscous, slightly acid solution which is slightly glairy and when diluted with more *water* and allowed to stand yields a very small amount of gummy deposit; insoluble in *alcohol (90 per cent.)*.

A 10 per cent. w/v aqueous solution is slightly dextrorotatory.

Tests for Identity. An aqueous solution gives with *solution of lead subacetate* a flocculent white precipitate.

When powdered it does not acquire a pink colour with *solution of ruthenium red* (distinction from sterculia gum and from agar).

It does not acquire a colour on the addition of *N/10 iodine* (distinction from other gums and from agar).

Dissolve 0·25 gramme in 5 millilitres of *water* by shaking in the cold, add 0·5 millilitre of *solution of hydrogen peroxide* and 0·5 millilitre of a 1 per cent. w/v solution of *benzidine* in *alcohol (90 per cent.)*; shake and allow to stand; a blue colour is produced (distinction from certain other gums).

Tests for Purity. A 10 per cent. w/v aqueous solution complies with the following tests:—To 10 millilitres add 0·2 millilitre of *solution of lead acetate*; no precipitate is produced.

To 10 millilitres, after previous boiling and cooling, add 0·1 millilitre of *N/10 iodine*; no blue or brown colour is produced (absence of starch and dextrin).

To 10 millilitres add 0·1 millilitre of *solution of ferric chloride;* no bluish-black colour is produced (absence of tannin).

Dissolve 5 grammes of powder in about 100 millilitres of *water* in a 250 millilitre Erlenmeyer flask; add 10 millilitres of *dilute hydrochloric acid* and boil gently for 15 minutes. Filter by suction while hot, through a filtering crucible previously tared, wash thoroughly with hot *water*; dry

at 100° and weigh. The weight of residue should not exceed 50 milligrammes (limit of water-insoluble matter).

Loses, when dried at 100°, not more than 15 per cent. of its weight. *Ash*, not more than 5 per cent.; *acid-insoluble ash*, not more than 0·5 per cent.

Preparations. Mucilago Acaciæ.
Pulvis Tragacanthæ Compositus.

ACONITUM

[ACONIT.]

Aconite

Indian name. Kashmiri—*Banbalnag.*

Aconite is the dried root of *Aconitum chasmanthum* Stapf. ex Holmes. (Fam. *Ranunculaceæ*). It contains not more than 5 per cent. of its aerial stems and not more than 2 per cent. of other foreign organic matter.

Characters. Root dark-brown, usually 2·5 to 3·7, rarely up to 5 centimetres long, 1·2 to 1·8 centimetres broad, bearing numerous rudiments of rootlets forming tubercle like protrusions, wrinkled transversely and longitudinally, latter more prominent; fracture somewhat cartilaginous, hard white within the cambium, brownish outside; microscopically, epidermis, of one or more layers of suberised cells, papillose on the outside. Stone cells absent, the primary cortex separated by distinct endodermis. Inner bark parenchymatous, containing very few groups of phlœm strands, occupying more than half the radius; cambium, having 6 to 10 angles, not scattered, not sharply stellate; in younger roots, xylem vessels scattered, often forming a V-shaped ring enclosing some xylem parenchyma; in older portions, bundles, compact, conical, often wedge-shaped, having acute apex; inner bark, lacunous. Starch grains, mostly simple, round, 6 to 18 microns in diameter, with central hilum.

Tests for Purity. *Acid-insoluble ash*, not more than 1 per cent.

Assay. Prepare a tincture as directed under Tinctura Aconiti and assay as directed thereunder.

Preparations. Linimentum Aconiti.
Tinctura Aconiti.

ÆTHER ANÆSTHETICUS

[Æther Anæsth.]

Anæsthetic Ether

Synonyms. Æther Purificatus: Purified Ether.

Anæsthetic Ether is ethyl ether, and may be obtained by distilling a mixture of ethyl alcohol and sulphuric acid and rectifying the distillate.

Characters. A colourless, transparent, very mobile liquid; odour, characteristic; taste, sweet and burning. Very volatile and inflammable; mixtures of its vapour with oxygen, air, or nitrous oxide in certain concentrations are explosive.

Soluble in 8·5 volumes of *water*; miscible in all proportions with *alcohol (90 per cent.)*, with *chloroform*, and with fixed and volatile oils.

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·720; *boiling-point*, 34° to 35°.

Pour 10 millilitres in successive portions on to a clean filter paper, and allow to evaporate spontaneously; no foreign odour is detectable at any stage of the evaporation.

Place in a stoppered tube, of about 12 millilitres capacity and about 1·5 centimetres diameter, 8 millilitres of *solution of potassium iodide and starch*; fill to the brim with a portion of the anæsthetic ether being tested, place the stopper in position so that no air bubble is enclosed, shake vigorously, and set aside in the dark for thirty minutes; no brown or reddish colour is produced (limit of peroxides).

Place 2 millilitres of *alkaline solution of potassio-mercuric iodide* in a stoppered tube, as described in the previous test, and fill the tube with a portion of the anæsthetic ether being tested; insert the stopper, shake vigorously for ten seconds, and set aside for five minutes; no colour or turbidity is produced. If colour or turbidity is produced, due to Hydroquinone being present as a preservative, distil the anæsthetic ether in a fractionating column and repeat the same test with the distillate; no colour or turbidity shall appear (limit of acetone and aldehyde).

Shake vigorously in a separator 2 volumes of the anæsthetic ether being tested with 1 volume of *alcohol* (*20 per cent.*) and 1 volume of *water*. Allow the mixture to separate, and draw off the lower layer. To 5 millilitres of this lower layer add 2·0 millilitres of solution of *potassium permanganate in phosphoric acid*; set aside for ten minutes, and add 2·0 millilitres of *solution of oxalic and sulphuric acids*; to the colourless solution add 5 millilitres of *decolourised solution of magenta*, and set aside for ten minutes; no colour is produced (absence of methyl alcohol).

Storage. Anæsthetic Ether shall be placed in a dry bottle, protected from light, or in a copper container or a container copper plated internally and stored in a cool place. The bottle shall be closed with a well-fitting glass stopper, or with velvet cork covered with tin foil. A thickly tinned container with leak-proof closing arrangements may also be used.

NOTE. *It is absolutely essential that a preservative of the type of Sodium pyrogallate, Hydroquinone or Propyl gallate, in suitable concentrations shall be added in Anæsthetic Ether intended for use in tropical climates, unless the Anæsthetic Ether is stored in a copper container or in a container copper plated internally. The preservative used shall be declared on the label.*

ALOE

[Aloe]

Aloes

Synonym. Musabbar.

Aloes is the dried juice of the leaves of *Aloe barbadensis* Linn. (Fam. *Liliaceæ*) and other species of *Aloes*.

Characters. Dark chocolate brown to black, irregular mass; surface dull, opaque, with slightly vitreous appearance; microscopically, powder mounted in glycerine shows innumerable crystallised particles embedded in a brownish matrix; or dark brown, or greenish-brown, glassy masses, transparent in thin fragments (Cape aloes); or hard, dark brown opaque masses with an uneven porous fracture (Socotrine aloes); or dark, reddish-brown, opaque masses with a nearly smooth and slightly porous fracture (Zanzibar aloes). Odour characteristic; taste, nauseous and bitter.

Tests for Identity. Boil 0·5 gramme with 50 millilitres of *water* until nearly dissolved, cool, add 0·5 gramme of *kieselguhr*, and filter; to the filtrate apply the following tests:—

To 5 millilitres add 0·2 gramme of *borax*, and heat until dissolved; add a few drops of this solution to a test-tube nearly filled with *water*; a green fluorescence is produced.

Mix 2 millilitres with 2 millilitres of freshly prepared *solution of bromine*; pale yellow precipitate is produced.

Mix 5 millilitres with 2 millilitres of *nitric acid*; with Indian and Curacao aloes a deep brownish-red, with Cape aloes a yellowish-brown colour passing rapidly to a vivid green, with Socotrine aloes a pale brownish-yellow, and with Zanzibar aloes a yellowish-brown colour, is produced.

Tests for Purity. Loses, when dried at 100°, not more than 10 per cent. of its weight; *ash*, not more than 5 per cent.

Add 1 gramme in powder, accurately weighed, to 50 millilitres of *alcohol* (*95 per cent.*) in a flask. Boil the mixture for 15 minutes replacing any loss by evaporation. Remove the heat and shake the flask at intervals during 1 hour, filter through a small dried and tared filter paper or a suitable filtering crucible and wash the residue on the filter with *alcohol* (*95 per cent.*) till the washings are colourless. Dry at 100° to constant weight; the residue does not weigh more than 0·1 gramme (limit of alcohol insoluble matter).

Macerate 2 grammes in powder, accurately weighed, in about 60 to 70 millilitres of *water* in a flask. Shake the mixture at 30 minutes intervals for 8 hours and allow to stand for a further 16 hours without shaking. Filter, wash the flask and the residue with small portions of *water*, passing the washings through the filter, until the filtrate measures 100 millilitres. Evaporate 50 millilitres of this filtrate to dryness in a tared dish on a water bath and dry to constant weight at 110°; the residue does not weigh less than 0·5 gramme (water-soluble extractive).

Preparations. Pilula Aloes.
Pilula Aloes et Asafœtidæ.
Pilula Aloes et Ferri.

DOSES

Metric.	Imperial.
0·12 to 0·3 gramme.	2 to 5 grains.

AMARANTHUM

[Amaranth.]

Amaranth

Synonym. Red No. 2 (Colour Index No. 184; Society of Dyers and Colourists, U. K.).

Amaranth is the trisodium salt of 1-(4-sulpho-1-naphthylazo)-2-naphthol-3 : 6-disulphonic acid, and may be prepared by the coupling of diazotised 1-naphthylamine-4-sulphonic acid with 2-napthol-6 : 8-disulphonic acid.

Characters. Dark reddish-brown powder.

Dissolves in about 15 parts of *water* at 25°; very slightly soluble in *alcohol* (*95 per cent.*).

Tests for Identity and Purity. The colour of a 1 per cent. w/v aqueous solution when viewed through a depth of 1 centimetre is vivid red. The colour of this aqueous solution is not appreciably changed by the addition of *hydrochloric acid; N/1 sodium hydroxide* intensifies the colour.

Boil a 1 per cent. w/v aqueous solution of amaranth with aluminium hydroxide, filter and add a drop of a 1 per cent. w/v aqueous solution of *copper sulphate.* A yellow colour that changes to red on acidification indicates the presence of amaranth.

Arsenic limit, 10 parts per million.

APPLICATIO DERRIDIS

[Applicat. Derrid.]

Derris Application

Derris, *in very fine powder* . . .	25 grammes.
Hard Soap	6·9 grammes.
Distilled Water, sufficient to produce .	1,000 millilitres.

Dissolve the Hard Soap in warm Distilled Water, add the finely powdered Derris, mix thoroughly and add sufficient Distilled Water to produce the required volume. It should be recently prepared.

AQUA AURANTII FLORIS

[Aq. Aurant. Flor.]

Orange Flower Water

Orange Flower Water is a saturated solution of the odoriferous principles of the flowers of *Citrus aurantium* Linn. (Fam. *Rutaceæ*), prepared by distilling the fresh flowers with water and separating the excess volatile oil from the clear aqueous portion of the distillate.

Characters. Nearly colourless, clear or faintly opalescent liquid; odour, pleasant; taste, that of orange blossoms. Free from empyreuma, mustiness, and fungoid growths.

Orange Flower Water is neutral or slightly acid to litmus paper.

Tests for Purity. Evaporate 100 millilitres on water bath, and dry the residue to constant weight. The weight of the residue is not more than 15 milligrammes.

To 5 millilitres, add 2 millilitres of *dilute acetic acid* and carry out the *test for heavy metals,* the limit of which is 2 parts per million (limit of heavy metals).

AQUA CASSIÆ CONCENTRATA

[Aq. Cassi. Conc.]

Concentrated Cassia Water

Oil of Cassia	20 millilitres.
Alcohol (90 per cent.)	600 millilitres.
Distilled Water, sufficient to produce .	1,000 millilitres.

Dissolve the Oil of Cassia in the Alcohol (90 per cent.), and add sufficient Distilled Water in successive small quantities to produce 1,000 millilitres, shaking vigorously after each addition. Add 50 grammes of *powdered talc*, and shake ; set aside for a few hours, occasionally shaking ; filter.

Alcohol content, 52 to 56 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·3 to 1 mil.	5 to 15 minims.

Concentrated Cassia Water, when diluted with 39 times its volume of Distilled Water, yields a preparation which is approximately equivalent in strength to Distilled Cassia Water, but contains about 1·5 per cent. v/v of Alcohol (90 per cent.).

AQUA CASSIÆ DESTILLATA

[Aq. Cassi. Dest.]

Distilled Cassia Water

Cassia Cinnamon	100 grammes.
Water	2,000 millilitres.

Distil 1,000 millilitres by the process described under 'Aquæ Aromaticæ (*a*)'.

DOSES

Metric.	Imperial.
15 to 30 mils.	1/2 to 1 fluid ounce.

When Aqua Cassiæ, or Cassia Water is prescribed the Distilled Water not being specified, Cassia Water made by any of the methods described under 'Aquæ Aromaticæ' shall be dispensed.

AQUA FŒNICULI CONCENTRATA

[Aq. Fœnic. Conc.]

Concentrated Fennel Water

Oil of Fennel	20 millilitres.
Alcohol (90 per cent.)	600 millilitres.
Distilled Water, sufficient to produce .	1,000 millilitres.

Dissolve the Oil of Fennel in the Alcohol (90 per cent.), and add sufficient Distilled Water in successive small quantities to produce 1,000 millilitres, shaking vigorously after each addition. Add 50 grammes of *powdered talc*, and shake ; set aside for a few hours, occasionally shaking ; filter.

Alcohol content, 52 to 56 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·3 to 1 mil.	5 to 15 minims.

Concentrated Fennel Water, when diluted with 39 times its volume of Distilled Water, yields a preparation which is approximately equivalent in strength to Distilled Cinnamon Water, but contains about 1·5 per cent. v/v of Alcohol (90 per cent.).

AQUA FŒNICULI DESTILLATA

[Aq. Fœnic. Dest.]

Distilled Fennel Water

Fennel	100 grammes.
Water	2,000 millilitres.

Distil 1,000 millilitres by the process described under 'Aqua Aromaticæ (*a*)'.

DOSES

Metric.	Imperial.
15 to 30 mils.	1/2 to 1 fluid ounce.

When Aqua Fœniculi, or Fennel Water is prescribed, the distilled water not being specified, Fennel Water made by any of the methods under 'Aquæ Aromaticæ' shall be dispensed.

AQUA PRO INJECTIONE

[Aq. Pro. Inject.]

Water for Injection

CAUTION. *In any part of India in which Aqua Pro Injectione is controlled by law, care must be taken that the provisions of such law are duly complied with* (*see page* ix).

Water for Injection is water for parenteral use which has been distilled and sterilised within 24 hours. It is prepared by redistilling Distilled Water from apparatus made of neutral resistance glass which has been cleansed with a caustic alkali or a mineral acid, all traces of alkali or acid being subsequently removed by washing with *water*. It may also be prepared by any other suitable process. The first portion of the distillate is rejected and the remainder is collected, sterilised, and stored in sealed or other suitable sterile containers, so that it is free from and remains free from pyrogens.

Tests for Purity. Separate portions of 10 millilitres remain clear and colourless on standing for five minutes, after the addition of 1 millilitre of the following test solutions :—*solution of barium chloride* (limit of sulphates), *solution of silver nitrate* (limit of chlorides).

100 millilitres remains clear and colourless on the addition of 1 drop of *solution of sodium sulphide* (limit of lead, copper, and iron).

50 millilitres, mixed with 2 millilitres of *alkaline solution of potassio-mercuric iodide*, when viewed in a Nessler glass standing on a white tile, does not, after five minutes, yield a more intense colour than that given by 50 millilitres of *ammonia-free water* with the addition of 2 millilitres of *dilute solution of ammonium chloride* (*Nessler's*), when tested under similar conditions (limit of ammonia).

When 100 millilitres is boiled for ten minutes with 3 millilitres of *sulphuric acid* and 1 millilitre of *N/100 potassium permanganate*, the colour is not completely destroyed (limit of oxidisable matter).

Leaves, on evaporation to dryness on a water-bath, not more than 0·001 per cent. w/v of residue.

Water for Injection complies with the *Sterility Tests* and the *Pyrogen Test*.

AQUA PUDINÆ CONCENTRATA

[Aq. Pudin. Conc.]

Concentrated Pudina Water

Pudina Oil	20 millilitres.
Alcohol (90 per cent.)	600 millilitres.
Distilled Water, sufficient to produce .	1,000 millilitres.

Dissolve the Pudina Oil in the Alcohol (90 per cent.), and add sufficient Distilled Water in successive small quantities to produce 1,000 millilitres, shaking vigorously after each addition. Add 50 grammes of *powdered talc*, and shake; set aside for a few hours, with occasional shaking; filter.

Alcohol content. 52 to 56 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·3 to 1 mil.	5 to 15 minims.

Concentrated Pudina Water, when diluted with 39 times its volume of Distilled Water, yields a preparation which is approximately equivalent in strength to Distilled Pudina Water, but contains about 1·5 per cent. v/v of Alcohol (90 per cent.).

AQUA PUDINÆ DESTILLATA

[Aq. Pudin. Dest.]

Distilled Pudina Water

Pudina Oil	1 millilitre.
Water	1,500 millilitres.

Distil 1,000 millilitres by the process described under 'Aquæ Aromaticæ (*a*)'.

DOSES

Metric.	Imperial.
15 to 30 mils.	1/2 to 1 fluid ounce.

When Pudina Water is prescribed, the distilled water not being specified, Pudina Water made by any of the methods described under 'Aquæ Aromaticæ' shall be dispensed.

ARECA

[Arec.]

Betel Nut

Indian names. Bengali—*Shupari*; Gujerathi—*Hopari*; Hindi and Marathi—*Supari*; Kanarese—*Adake*; Tamil—*Kamugu*; Telegu—*Cikinamu*; Oriya—*Gua*.

Areca is the dried ripe seed of *Areca catechu* Linn. (Fam. *Palmæ*). It contains not more than 2 per cent. of adhering pericarp and not more than 1 per cent. of other organic matter.

It yields not less than 0·20 per cent. of ether-soluble alkaloids calculated as arecoline.

Characters. Rounded-conical; externally weak reddish brown to light yellowish brown, marked with a network of paler lines, and frequently with adhering portions of silvery brittle endocarp and adhering fibres of the mesocarp at the base of the seed. Seed hard, the cut surface exhibiting a marbled appearance (ruminate endosperm) of brownish tissue alternating with whitish tissue. Microscopically, seed coat of several rows of tangentially elongated cells with the inner walls more or less thickened; the whitish endosperm tissue cells with thick porous walls and containing oil globules and aleurone grains; the brownish perisperm tissue with thin-walled cells and delicate tracheæ.

In powder, colour weak reddish brown to light brown; odour, slight; taste, astringent, slightly bitter; consisting principally of fragments of the endosperm tissue with porous reserve-cellulose walls; irregularly thickened stone cells of the seed coat; a few aleurone grains up to 40 microns in diameter and a few oil globules; starch absent, and tracheal tubes few.

Tests for Purity. *Ash*, not more than 2·5 per cent.

Assay. Place, 8 grammes, in *moderately coarse powder* and accurately weighed, into a suitable flask, add 80 millilitres of *ether*, shake well, add 4 millilitres of *dilute solution of ammonia*, and shake for ten minutes. Add 10 grammes of *anhydrous sodium sulphate* and shake for five minutes. Allow to settle and decant the ether into another flask. Wash with ether. Add 0·5 gramme of purified *talc* to the decanted ether solution and shake for three minutes, then add 2·5 millilitres of *water* and shake for three minutes more. Allow to stand until clear, decant 50 millilitres of the ether. Extract the remaining ether in a separator, or in the distilling flask with 15 millilitres of *N/50 sulphuric acid* and then with three portions of *water*, using 5 millilitres each time. To the combined acid and washings, add *solution of methyl red* and titrate the excess acid with *N/50 sodium hydroxide solution*. Each millilitre of *N/50 sulphuric acid* is equivalent to 0·0031 gramme of arecoline.

DOSES

	Metric.	Imperial.
For Dog	2 to 4 grammes.	30 to 60 grains.
For Sheep	4 to 8 grammes.	60 to 120 grains.

ARISTOLOCHIA

[Aristoloch.]

Aristolochia

Synonym. Indian Birthwort.

Indian names. Bengali—*Isharmul;* Hindi—*Isarmul;* Kanarese—*Ishveri-veru;* Malayalam—*Karabkam;* Sanskrit—*Arkamula;* Tamil—*Ichchura-muli;* Telegu—*Ishvara-veru.*

Aristolochia consists of the dried stem and root of *Aristolochia indica* Linn. (Fam. *Aristolochiaceæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Stems, cut into pieces about 10 centimetres long and 5 to 10 millimetres in diameter, round, having a number of longitudinal ridges, and leaves arranged alternately on it. Yellowish in colour, internodes short, external surface rough and glabrous. Roots knotty, tapering like typical tap-roots, with numerous branch roots. The main root at the thickest part is about 1 to 1·5 centimetres in diameter. Surface dull brown, corky, somewhat smooth. Root bark comparatively thick and separate out in some places. The wood is coloured white. Fracture, fibrous. Microscopically, outerbark of stem consists of several layers of cork cells, the inner bark contains groups of sclerenchymatous fibres and some parenchymatous cells containing cystoliths. Cambium, distinct. Bundles, very large, elongated. Medullary rays, several cells wide. Pith, very small, made of large sized thin-walled rounded cells. Outer bark of root, thin; inner bark, quite thick, and contains numerous groups of lignified fibres. Parenchyma cells of inner bark contain cystoliths and other types of crystals. Wood, very large, compact, hard, fibrous. Xylem consists of small sized vessels having walls with bordered pits and xylem fibres. Taste, somewhat bitter.

Preparation. Tinctura Aristolochiæ.

ARTEMISIA

[Artemis.]

Artemisia

Indian names. Hindi—*Kirmala*; Kashmiri—*Murni*; Marathi—*Kiramaniowa*; Pushtoo—*Turkh.*

Artemisia consists of the dried immature leaves or flowerheads of *Artemisia brevifolia* Wall and *Artemisia maritima* Linn. forma *rubricaule* Badhwar (Fam. *Compositæ*) collected in early summer or late spring respectively when the flowerheads are approaching full development. It must be entirely free from stem and contains not more than 2 per cent. of other organic matter.

It contains not less than 0·75 per cent. of Santonin.

Characters. Leaves, 1·3 to 5 centimetres long, 2-pinnatisect, segments many, small, spreading, linear, more or less grey-hoary or tomentose, bluish-green; upper leaves, simple and linear. Petioles, slender and short. Heads, homogamous, 3 to 8 flowered, oblong or ovoid, 2·5 to 3 millimetres long, sessile or subsessile, in spicate fascicles in the axils of linear bracts or sub-setaceous leaves. Flowers, tubular, yellowish; involucral bracts, linear-oblong, with scarious margins. Corolla with a short cylindrical tube and narrowly companulate limb. In powder, involucral bracts, parts of tubular florets, anthersacs, portions of linear leaves, fragments of resinous material and microcrystalline structures are visibie. Odour, aromatic and sweet; taste, bitter and camphoraceous.

Tests for Identity. Boil 1 gramme of the finely powdered drug with about 10 millilitres of *alcohol* (*90 per cent.*) and filter; add a little *potassium hydroxide* to the filtrate and heat again. The liquid acquires a pronounced red colour.

Assay. Extract about 10 grammes, accurately weighed, in *No. 30 Powder* in a Soxhlet extractor for 3 hours with *chloroform*. Distil the *chloroform* until 7 to 8 millilitres remain, add 100 millilitres of a 5 per cent. w/v solution of *barium hydroxide*, and heat on a steam bath until the odour of *chloroform* has disappeared. Boil for 5 minutes, cool, and saturate with *carbon dioxide* gas (washed through *sodium bicarbonate* solution to remove traces of acid). Filter on a small Buchner funnel, using suction and wash twice with 10 millilitres of *water*. Heat the filtrate on a steam bath, add 5 millilitres of a mixture of 2 parts by volume of *hydrochloric acid* and 1 part by volume of *water*, and warm for 5 minutes. Cool until lukewarm and extract with 20, 15, and 15 millilitre portions of *chloroform*, passing the solvent through a pledget of *absorbent cotton* into a flask. Evaporate to dryness, removing the last traces of chloroform. Dissolve in 7·5 grammes (9·5 millilitres) of *dehydrated alcohol*, warming gently if necessary. Add 42·5 millilitres of water heated to 60° to 70°, stopper the flask, and allow to cool. Start crystallisation at this point by scratching the side of the flask with a rod or by seeding with a minute crystal of Santonin. Maintain the flask and contents at a temperature of 15° to 17° for 24 hours. Filter and wash at 15° to 17° with two 10 millilitre portions of alcohol (15 per cent. by weight). Dry the flask and filter at 100°; dissolve the santonin left in the flask and on the filter in *chloroform*; and filter into a weighed beaker. Wash the flask and paper thoroughly with *chloroform*, evaporate the combined filtrate and washings, dry at 100° to remove all traces of *chloroform*, and weigh. To the weight found add 0·04 gramme for the santonin dissolved in the dilute *alcohol* multiply the total by 10 to obtain the percentage of santonin.

DOSES

Metric.	Imperial.
1 to 1·5 grammes.	15 to 25 grains.

ASAFŒTIDA

[Asafœt.]

Asafœtida

Synonym. Hing : Hingu.

Asafœtida is an oleo-gum-resin, obtained by incision, from the living rhizome and root of *Ferula narthex* Zoiss, *Ferula fœtida* Regel, and other species of *Ferula* (Fam. *Umbelliferæ*).

Asafœtida yields not less than 50 per cent. of *alcohol (90 per cent.)-soluble extractive*.

Characters. Rounded or flattened tears, mostly from 12 to 25 millimetres in diameter, or in masses of agglutinated tears; greyish-white to dull yellow. The freshly exposed surface, yellowish and translucent, or milk-white and opaque, slowly becoming pink, red, and finally reddish-brown; touched with sulphuric acid a bright red or reddish brown colour is produced, changing to violet when the acid is washed off with water. Odour, strong, alliaceous and persistent; taste, bitter and acrid.

Tests for Identity. Triturated with *water* it yields a milky-white emulsion. Boil 0·2 gramme with 2 millilitres of *hydrochloric acid* for about one minute, cool, dilute with an equal volume of *water*, and filter into 3 millilitres of *dilute solution of ammonia*; a fluorescence is produced.

Tests for Purity. Triturate 1 gramme with 10 millilitres of *light petroleum* (boiling point, 40° to 50°) for 2 minutes, filter into a test tube and add to the filtrate 10 millilitres of a fresh 0·5 per cent. w/v aqueous solution of *copper acetate*; shake well and allow the liquids to separate. The petroleum layer does not show any green colour (absence of rosin).

Ash, not more than 15 per cent.

Assay. Place about 5 grammes, accurately weighed, in a small beaker furnished with a glass rod, and tared; add 50 millilitres of *alcohol* (*90 per cent.*), and boil gently. Filter the hot solution through a tared filter paper, and boil the residue with further quantities of *alcohol* (*90 per cent.*) until all soluble matter is removed, using the glass rod to disintegrate the insoluble matter. Wash the filter paper with hot *alcohol* (*90 per cent.*); transfer the paper to the beaker, dry at 100°, and weigh. The residue weighs not more than 50 per cent. of the original sample taken.

Preparations. Pilula Alœs et Asafœtidæ.
Tinctura Asafœtidæ.

DOSES

Metric.	Imperial.
0·3 to 1 gramme.	5 to 15 grains.

AURANTII DULCIS CORTEX

[Aurant. Dul. Cort.]

Sweet-Orange Peel

Indian names. Bengali—*Kamalanebur khosa*; Hindi—*Naringi-ka-chhilka.*

Sweet Orange Peel is the fresh or dried outer part of the pericarp of the ripe or nearly ripe fruit of *Citrus aurantium* Linn. var. *sinensis* Linn. (Fam. *Rutaceæ*).

Characters. Thin strips with but little of the inner white portion of the rind, 3 to 4 millimetres thick, orange-red, glabrous, smooth, glassy, oily, slightly pitted; oil glands visible as small dots of dark orange colour. In transverse section, epidermal cells, of one layer, rectangular, cutinised; below the epidermis, parenchymatous cells, thick-walled, containing orange coloured chromoplastids and occasional calcium oxalate crystals and 2 rows of Schizoly sigenous oil cavities. Odour, sweet, fragrant; taste, bitter, aromatic.

Preparations. Tinctura Aurantii.
Syrupus Aurantii.

AYAPANA

[Ayap.]

Ayapan

Indian names. Bengali, Hindi and Marathi—*Ayapana*; Gujerathi—*Aleppa.*

Ayapan consists of the dried leaves of *Eupatorium ayapana* Vent. (Fam. *Compositæ*). It contains not more than 2 per cent. of other organic matter.

It yields not less than 0·1 per cent. of ayapin and ayapanin.

Characters. Leaves, deep greenish above, paler below, lanceolate 3-nerved, subsessile, opposite, subentire, glabrous, 5 to 7·5 centimetres long, 1·2 to 1·8 centimetres wide, very thin and papery. Microscopically, upper epidermis of straight walled cells, stomata very few; lower epidermis of wavy walled cells, stomata numerous, subsidiary cells usually 3, situated obliquely. Stomata, cruciferous. Few small sized prismatic crystals as well as few uniserrate 4-celled hairs, with pointed apical cells are present. Leaves, isobilateral, the mesophyll tissue, not differentiated into spongy and palisade. Cystoliths absent. Collenchymatous tissue present in the veins. Section of stem is typical, dicotyledonous, with pericycle caps over bundles and collenchymatous hypodermis. Brownish small sized oil globules present in most of the leaf cells.

Ayapana in powder form shows almost complete absence of hairs, cystoliths, etc., presence of cruciferous stomata and absence of palisade tissue. Presence of small oil globules in most of the leaf cells characteristic. Odour, aromatic; taste, aromatic.

Assay. Take about 20 grammes, accurately weighed, of the powdered drug and boil with 150 millilitres of *water* for three hours and filter while hot. Repeat the extraction twice, combine the filtrates, cool, and extract thoroughly with *chloroform*. Filter through a filter paper wetted with chloroform to remove any water contained in the extract into a tared flask; wash the filter paper with 5 millilitres of chloroform, collecting the washings in the same flask; remove the solvent on a water bath, cool it in a desiccator, and weigh. The weight of the residue in the flask gives the combined weight of Ayapin and Ayapanin.

Preparation. Extractum Ayapanae Liquidum.

BELÆ FRUCTUS

[Belæ Fruct.]

Bael

Indian names. Assamese, Bengali, Hindi and Marathi—*Bel;* Gujerathi—*Bil;* Malayalam—*Kuvalap-pazham;* Sanskrit—*Bilva, Sriphal;* Tamil—*Vilva pazham;* Telegu—*Maredu.*

Bael consists of the entire fresh unripe or half-ripe fruit of *Aegle marmelos* (Linn.) Correa. (Fam. *Rutaceæ*).

Characters. Subglobose berry, greenish, with smooth surface; epicarp, woody, hard, about 3 millimetres thick, reddish, inner portion fibrous. Mesocarp and endocarp, adherent to the rind, forms the pulp, pale reddish in colour; carpels, 10 to 15, central, each containing several seeds, with oblong flat multicellular woolly white hairs; seeds surrounded by colourless sticky mucilage. Odour, faintly aromatic; taste, mucilaginous and slightly astringent.

Preparation. Extractum Belæ Fructus Liquidum.

BERBERINÆ SULPHAS

[Berberin. Sulph.]

Berberine Sulphate

$C_{20}H_{18}O_4N(HSO_4)$ . . . . . Mol. Wt. 433·2.

Berberine Sulphate is the acid sulphate of an alkaloid, berberine, obtained chiefly from *Berberis aristata* D.C. (Fam. *Berberidaceæ*) and *Coptis teeta* Wall. (Fam. *Ranunculaceæ*).

Characters. Bright yellow acicular crystals or dark yellow powder; taste, bitter.

Soluble in *water* (1 in 100) and in *alcohol (90 per cent.)*.

Tests for Identity. Dissolve 0·05 gramme in 5 millilitres of cold *water* and add 2 drops of *solution of sodium hydroxide*. The solution remains clear but becomes orange-red in colour.

Dissolve 0·05 gramme in 5 millilitres of cold *water* and add 4 drops of *acetone*; a turbidity develops and on standing a yellow precipitate separates.

A 1 per cent. w/v solution in *water* yields the reactions characteristic of sulphates.

Tests for Purity. Loses, on drying at 100°, not more than 1 per cent. of its weight.

Ash, not more than 0·1 per cent.

Sterilisation of a Solution. A solution of Berberine Sulphate for injection is sterilised by *heating in an autoclave* or by *filtration*.

DOSES

Metric.	Imperial.
0·06 to 0·3 gramme.	1 to 5 grains.

BERBERIS

[Berber.]

Berberis

Indian names. Bengali—*Daru-haridra* ; Hindi—*Dar-hala* ; Nepalese—*Chitra* ; Punjabi—*Khismal* ; Tamil—*Kasturimanjal, Maramanjal.*

Berberis consists of the dried roots of *Berberis aristata* D.C. and of closely allied species of *Berberis* (Fam. *Berberidaceæ*) with the bark intact and having a maximum diameter of 45 millimetres. It contains not more than 5 per cent. of attached stems and not more than 2 per cent. of other organic matter.

It contains not less than 1 per cent of the total alkaloids, calculated as berberine.

Characters. Roots, yellowish brown, cylindrical, more or less knotty, hard and tough, usually cut into pieces of varying length, up to 45 millimetres in diameter, often split, few root branches. Bark, internally dark brown, less than 1 millimetre in length, soft and breaking away in powdery mass. Wood, lemon yellow, distinctly radiated, with narrow medullary rays, pith mostly absent, bright yellow if present. In transverse section, few layers of cork, narrow cortex of parenchyma containing yellowish brown amorphous contents; cambium ring, very narrow; bast fibres of secondary phloem in several layers often cut radially by secondary medullary rays. Numerous open collateral vascular bundles separated by medullary rays. Cells of medullary ray contain large number of starch grains with 2 to 3 components. Xylem, broad, consisting of numerous wood fibres intermingled with pitted tracheæ; pith, absent; broad patches of medullary rays alternating with xylem fibres and pitted vessels distinct. Odour, slight; taste, bitter.

Berberis, in powder form, bright yellow, composed chiefly of fragments of medullary rays and wood fibres associated with a few tracheæ. Wood fibres yellowish with large simple transverse pores, tracheæ chiefly with bordered pores. Starch grains plenty, simple or with 2 to 3 components, individual grains being irregularly spherical, 3 to 20 microns in diameter.

Test for Purity. *Acid-insoluble ash*, not more than 2 per cent.

Assay. Extract 10 grammes in *No. 60 Powder* in a Soxhlet with alcohol (*90 per cent.*) until exhausted. Remove the alcohol and dissolve the residue in a little *water*, add 30 millilitres of a 15 per cent. w/v solution of *sodium hydroxide* and shake for half an hour with 300 millilitres of *ether*. Precipitate 30 millilitres of the ethereal extract (equivalent to 1 gramme of bark) with 5 millilitres of a solution of *picrolonic acid*, dry and weigh. The weight so obtained multiplied by 0·561 is the weight of berberine.

Preparations. Extractum Berberidis.
Tinctura Berberidis.

DOSES

Metric.	**Imperial.**
2 to 3 grammes.	**30 to 45 grains.**

CALAMINA PRÆPARATA

[Calamin. Præp.]

Prepared Calamine

Prepared Calamine is zinc oxide with a small amount of ferric oxide, and contains, after ignition, not less than 98 per cent. ZnO.

Characters. Pink, powder, passing through a *No. 100 sieve.* Odourless; almost tasteless.

Insoluble in *water* but dissolves almost completely in mineral acids.

Test for Identity. A filtered solution of prepared calamine in *dilute hydrochloric* acid yields the reactions characteristic for zinc.

Test for Purity. Ignite 0·5 gramme, the loss in weight does not exceed 5 milligrammes (loss on ignition).

One gramme dissolved in 25 millilitres of *dilute hydrochloric acid,* leaves not more than 20 milligrammes of residue (limit of acid-insoluble substances).

Digest one gramme with 20 millilitres of warm *water*, filter, and add 2 drops of *solution of phenolphthalein*; if a red colour is produced not more than 0·2 millilitre of *N/10 sulphuric acid* is required to discharge it (limit of alkaline substances).

Dissolve 0·2 gramme in 20 millilitres of *water* and 1 millilitre of *glacial acetic acid* and filter. To the bright filtrate add 2 millilitres of *strong solution of ammonia* and 2 millilitres of *solution of sodium phosphate.* No turbidity or flocculent precipitate should be formed (limit of calcium or magnesium).

To 1 gramme add 15 millilitres of *water* and stir well; add 3 millilitres of *glacial acetic acid,* warm on a water bath until dissolved and filter. On the addition of 5 drops of *solution of potassium chromate* to the filtrate no turbidity is produced (limit of lead).

Arsenic limit, 0·2 part per million.

Assay. Ignite about 1·5 grammes, cool, weigh accurately and dissolve it as completely as possible by warming in 50 millilitres of *N/1 sulphuric acid.* Filter the solution and wash the residue and filter with hot *water* until the washings are no longer acid to *blue litmus paper.* Combine the filtrate and washings, cool, and titrate with *N/1 sodium hydroxide,* using *solution of methyl orange* as indicator. Each millilitre of *N/1 sulphuric acid* is equivalent to 0·04069 gramme of ZnO.

Preparation. Lotio Calaminæ.

CALCII SULPHAS EXSICCATUS

[Calc. Sulph. Exsic.]

Plaster of Paris

$CaSO_4.\frac{1}{2}H_2O$ . . . . Mol. Wt. 145·14.

Plaster of Paris is obtained by partially dehydrating gypsum by exposing it to a temperature of about 125°.

Characters. Dry white powder passing completely through a *No. 60 sieve*; when passed through a *No. 100 sieve,* leaves not more than 3 per cent. of residue. Slightly soluble in *water,* solubility decreasing sharply with rise of temperature.

Tests for Purity. Prepare an aqueous extract shaking 5 grammes of the material with 20 millilitres of *water*; filter. The filtrate is neither alkaline to *solution of phenolphthalein* nor acid to solution of litmus.

Dissolve 0·5 gramme in 30 millilitres of a mixture of 1 part by volume of *hydrochloric acid* and 2 parts by volume of *water* and evaporate to dryness in a dish on a water bath. Heat for 2 hours at 120° and again add 20 millilitres of acid. Warm for a few minutes and filter. Wash the residue with warm *water* to free it from chlorides, dry ignite and weigh. The residue should not weigh more than 5 milligrammes (limit of insoluble matter).

Loses, on drying at 45° ± 2° for 2 hours, not more than 2 per cent. of its weight.

For determining the setting time, fill the mould of a *Vicats apparatus* with a paste made by mixing the plaster with *water* in the ratio of 100 grammes to 60 millilitres of water. Lower a 300 gramme needle gently into contact with the surface of the test block and then release the needle quickly. Repeat the test every 2 minutes on different parts of the block taking care to clear the needle after every test. The time of setting given by the period elapsing between the time when water is added to the plaster and the time when the needle no longer penetrates completely to the bottom of the block is not more than 7 minutes nor less than 4 minutes.

For determination of *tensile strength*, briquettes containing plaster and *water* in the ratio of 100 grammes to 60 millilitres shall be made in accordance with the dimension given in Fig. I of B.S.S. No. 146-1941. The briquettes shall be removed from the moulds after 1 hour and buried in *quick lime* for 7 days at the end of which time it shall be confirmed that the weight is constant. The *quick lime* must be fresh, rapid slaking and of such a size that it will all pass through 1 inch sieve and be retained on 1/8th inch sieve. The specimens must be buried at least 1 inch deep in the *quick lime* in a suitable container. The tensile strength of the briquettes shall be determined in a standard cement tensile strength testing machine, five briquettes from each sample shall be tested, and the average of the tensile strength for these 5 briquettes shall be taken as the ultimate tensile strength. If it is found that the tensile strength of one or two briquettes varies from the average by more than 15 per cent., these results shall be neglected and the average of the remainder taken. If the tensile strength of more than two briquettes varies from the average by more than 15 per cent. the test shall be repeated on 5 more freshly made briquettes. The tensile strength so determined shall not be less than 325 lbs. per square inch.

For determination of *compressive strength*, five moulds giving a 2 inch cube shall be filled with plaster and *water* in the ratio of 100 grammes to 60 millilitres. The cubes shall be removed from the moulds after 1 hour and buried in *quick lime* for 7 days at the end of which time it shall be confirmed that the weight is constant. The *quick lime* shall be fresh, rapid slaking and of such a size that it will all pass a 1 inch sieve and be retained on a 1/8th inch sieve. The specimens must be buried at least 1 inch deep in the *quick lime* in a suitable container. The compressive strength of the cubes shall be determined in a standard testing machine, five cubes from each sample shall be tested, and the average of the compressive strength for these 5 cubes shall be taken as the ultimate compressive strength. If it is found that the compressive strength of one or two cubes varies from the average by more than 15 per cent., these results shall be neglected and the average of the remainder taken. If the compressive strength of more than two cubes varies from the average by more than 15 per cent., the test shall be repeated on 5 more freshly made cubes. The compressive strength so determined shall not be less than 1,400 lbs. per square inch.

Storage. Plaster of Paris should be stored in a sound, clean, dry and water-tight container.

CALX CHLORINATA

[Calx Chlorinat.]

Chlorinated Lime

Chlorinated Lime may be obtained by the action of chlorine upon calcium hydroxide, 5 to 10 per cent. of calcium oxide is subsequently added.

It contains not less than 25 per cent. w/w. of available chlorine.

Characters. A dry, dull white powder; odour, characteristic. Becomes moist and gradually decomposes on exposure to air.

Partly soluble in *water*, and in *alcohol* (*90 per cent.*).

Tests for Identity. Evolves chlorine copiously on the addition of *dilute hydrochloric acid.*

Yields the *reactions* characteristic of calcium, and of chlorides.

Assay. Triturate about 4 grammes, accurately weighed, in a mortar with successive small quantities of *water*, and transfer to a litre flask. When all the powder has been transferred to the flask, dilute to 1 litre, and shake thoroughly. Mix 100 millilitres of this suspension with 3 grammes of *potassium iodide*, dissolved in 100 millilitres of *water*; acidify with 5 millilitres of *acetic acid*, and titrate the liberated iodine with *N/10 sodium thiosulphate.* Each millilitre of *N/10 sodium thiosulphate* is equivalent to 0·003546 gramme of available chlorine.

Storage. Chlorinated Lime should be stored in a hermetically sealed container.

Preparation. Liquor Sodæ Chlorinatæ Chirurgicalis.

CANNABIS

[Cannab.]

Cannabis

Synonyms. Cannabis Indica : Indian Hemp.

Indian names. Bengali and Hindi—*Ganja ;* Sanskrit—*Ganjika ;* Tamil—*Gunja-ilai.*

Cannabis consists of the dried flowering tops of the cultivated pistillate plants of *Cannabis sativa* Linn. (Fam. *Urticaceæ*).

It contains not more than 10 per cent. of its fruits, large foliage leaves, and stems over 3 millimetres in diameter, and not more than 2 per cent. of other organic matter.

Characters. In compressed, rough, dusky, green masses, consisting of the branched upper part of the stem, bearing leaves and pistillate flowers or fruits matted together by a resinous secretion. Upper leaves, simple, alternate, 1-3 partite; lower leaves, opposite and digitate, consisting of five to seven linear lanceolate leaflets with distantly serrated margins. Fruit, one-seeded and supported by an ovate-lanceolate bract. Both leaves and bracts bear external oleoresin glands and one-celled curved pairs the bases of which are enlarged and contain cystoliths. Stem, cortex composed of collenchyma and several layers of parenchyma, in the larger stems, the phlœm with numerous strands of more or less lignified bast-fibers; the xylem with strongly lignified wood having medullary rays 1-cell wide; pith, often hollow; rosette aggregates of calcium oxalate, numerous. Odour, strong, characteristic and narcotic; taste, somewhat acrid and pungent.

In powder, dark green; epidermis from lower surface of leaves with sinuate vertical walls and numerous oval stomata, from upper surface with straight walls and no stomata; non-glandular hairs, numerous, unicellular, rigid, curved, with a very slender pointed apex and an enlarged base usually

containing a cystolith; glandular hairs of two kinds, one with a short 1-celled stalk, the other with a long multi-cellular, tongue-shaped stalk, the head being globular and consisting of 8 to 16 cells; fragments of bracts and leaves showing yellowish-brown laticiferous vessels, numerous rosette aggregates of calcium oxalate, 0·005 to 0·030 millimetre in diameter, and strands of spiral tracheæ and phlœm; fragments of fruits with palisade-like, non-lignified cells with yellowish-brown finely porous walls; tissues of embryo and endosperm with numerous oil globules and aleurone grains, the latter from 0·005 to 0·010 millimetre in diameter and displaying crystalloids and globoids.

Tests for Identity and Purity. *Dilute hydrochloric acid* added to the powdered drug causes effervescence, visible under the microscope.

Shake 0·1 gramme in powder with 5 millilitres of light petroleum for three minutes and filter; to 1 millilitre of the filtrate add 2 millilitres of a 15 per cent. w/v solution of hydrochloric acid in dehydrated alcohol; at the junction of the two liquids a red colouration appears, and after shaking, the upper layer becomes colourless and the lower layer acquires an orange-pink colouration which disappears on the addition of one millilitre of water.

Take 10 grammes in *fine powder*, accurately weighed, and add 100 millilitres of *alcohol* (*90 per cent.*). Shake occasionally during 24 hours and filter. 20 millilitres of the filtrate, evaporated and dried at 100°, weighs not less than 0·2 grammes (alcohol soluble extractive).

Ash, not more than 15 per cent.; *acid-insoluble ash*, not more than 5 per cent.

Preparations. Extractum Cannabis.
Tinctura Cannabis.

CARAMEL

[Caram.]

Caramel

Synonym. Burnt Sugar Colouring.

Caramel is a concentrated aqueous solution of the product obtained by heating sugar or glucose until the sweet taste is destroyed and uniform dark brown mass results, a small amount of alkali or alkali carbonate being added while heating.

Characters. Thick dark brown liquid with the characteristic odour of burnt sugar and a pleasant bitter taste.

Miscible with water in all proportions: miscible with dilute *alcohol* up to 55 per cent. by volume. Immiscible with *ether*, *chloroform*, *acetone*, *benzene*, *petroleum benzine*, and *oil of turpentine*.

Spread in a thin layer on a glass plate appears homogenous, reddish brown, and transparent.

Tests for Purity. *Specific gravity* at (25°/25°), not less than 1·30.

One part dissolved in 1,000 parts of *water* yields a clear solution having a distinct colour. The colour of this solution is not changed, and no precipitate is formed after exposure to sunlight for six hours.

To 20 millilitres of a 5 per cent. w/v aqueous solution, add 0·5 millilitre of *phosphoric acid*. No precipitate is produced.

When incinerated, caramel swells and forms a coke-like charcoal, which burns off only after prolonged heating at a high temperature.

Ash, not more than 8 per cent.

Storage. Caramel should be stored in securely corked containers.

CARBARSONUM

[Carbarson.]

Carbarsone

$C_7H_9AsN_2O_4$ . . . . . . Mol. Wt. 260·07.

Carbarsone is p-carbamino phenyl arsonic acid and may be obtained by the action of cyanic acid upon p-arsanilic acid.

Carbarsone, when dried at 80° for 6 hours, contains not less than 28·1 per cent. and not more than 28·8 per cent. of arsenic (As).

Characters. White powder; almost odourless having a slightly acid taste.

Slightly soluble in *water* and in alcohol (90 per cent.); nearly insoluble in chloroform, and in *ether*; soluble in solutions of alkali hydroxides and carbonates.

Tests for Identity. Place about 0·4 gramme in a test tube, add 5 millilitres of *solution of sodium hydroxide* and heat gently, a piece of moistened *red litmus paper* held over the mouth of the tube turns blue.

Place about 1 gramme in a test tube and dissolve in 10 millilitres of *N/1 sodium hydroxide*, and add 10 millilitres of water; add 2 grammes of *sodium hydrosulphite*, and warm the mixture to 50°; a light yellow precipitate, insoluble in an excess of *N/1 sodium hydroxide* is formed.

To a portion of the solution resulting from the *Assay* add a solution of *hydrogen sulfide*; a yellow precipitate of arsenic sulfide, soluble in a 20 per cent. *solution of ammonium carbonate* is produced.

Tests for Purity. *Melting point*, 169° to 172°. A saturated aqueous solution is acid to litmus. Loses, on drying at 80° for six hours, not more than 1·5 per cent. of its weight.

Dissolve 0·5 gramme in 2 millilitres of *dilute solution of ammonia*, dilute to 5 millilitres with *water*, add 3 millilitres of *magnesia mixture* and shake vigorously; no precipitate forms within 30 minutes (limit of arsenate).

Assay. Place about 0·2 gramme previously dried at 80° for 6 hours and accurately weighed, in a 200 to 300 millilitre glass-stoppered flask. Add 1 gramme of finely powdered *potassium permanganate* and 5 millilitres of *dilute sulphuric acid*, allow to stand for 10 minutes, frequently rotating the contents of the flask. Cautiously add 10 millilitres of *sulphuric acid* in portions of about 2 millilitres each, rotating the flask after each addition. When the reaction has ceased, add sufficient *solution of hydrogen peroxide* (3 per cent.) to dissolve the brown precipitate completely (about 5 to 7 millilitres). Towards the end of the reaction the *solution of hydrogen peroxide* (3 per cent.) should be added drop by drop to avoid any great excess.

Dilute with 25 millilitres of *water*, and boil gently over an asbestos wire gauze for 15 to 20 minutes, or until the excess of *solution of hydrogen peroxide* is expelled. Dilute with 50 millilitres of *water*, and add *N/10 potassium permanganate* until the liquid is faintly pink, then discharge the pink colour by the addition of a drop of *N/10 oxalic acid*. Cool the solution, add 2·5 grammes of *potassium iodide*, stopper the flask tightly and allow it to stand in a cool, dark place for 1 hour. Titrate the liberated iodine with *N/10 sodium thiosulphate* without the use of starch indicator. Carry out a blank test with the same quantities of reagents and in the same manner. Each millilitre of *N/10 sodium thiosulphate* is equivalent to 0·003746 gramme of As.

Storage. Carbarsone should be stored in well-closed containers.

DOSES

Metric.	Imperial.
0·15 to 0·25 gramme.	2 to 4 grains.

CARBO LIGNI ACTIVATUS

[Carbo. Lig. Activat.]

Activated Wood Charcoal

Activated Wood Charcoal is the residue from the destructive distillation of vegetable matter such as saw-dust, cellulose residues and coconut shells treated to increase its adsorptive power.

Characters. Fine, black, odourless, tasteless powder, free from gritty matter.

Tests for Purity. Boil 3 grammes with 60 millilitres of *water* for 5 minutes, allow to cool, dilute to the original volume with *water*, and filter. The filtrate is colourless and neutral to either *red or blue litmus paper* (limit of acid or alkali).

2 millilitres of the filtrate obtained in the test for limit of acid or alkali complies with the *limit test for chlorides*.

3 millilitres of the filtrate obtained in the test for limit of acid or alkali complies with the *limit test for sulphates*.

Boil 0·5 gramme with a mixture of 20 millilitres of *water* and 5 millilitres of *hydrochloric acid*. Lead paper is not blackened when held in the vapour of the boiling mixture (absence of sulphide).

Place a mixture of 5 grammes of Activated Wood Charcoal, 50 millilitres of *water*, and 2 grammes of tartaric acid in a distilling flask connected with a condenser provided with a tightly fitting adapter, the end of which dips under the surface of a mixture of 2 millilitres of *N/1 sodium hydroxide* and 10 millilitres of *water*, contained in a small flask surrounded by ice. Heat the flask to boiling, and distil about 25 millilitres. Dilute the distillate with *water* and mix thoroughly. To 25 millilitres of the diluted distillate add about 50 milligrammes of ferrous sulphate dissolved in 1 millilitre of *water*, heat the mixture almost to boiling, cool, and add 1 millilitre of *hydrochloric acid*. No blue colour is produced (absence of cyanogen compounds).

To 0·25 gramme add 10 millilitres of *N/1 sodium hydroxide*, heat to boiling, and filter. The filtrate is colourless (absence of uncarbonised matter).

Boil 1 gramme of activated wood charcoal with a mixture of 8 millilitres of *hydrochloric acid*, 12 millilitres of *water*, and 5 millilitres of *bromine water* for 5 minutes, filter, and wash the charcoal and filter with 50 millilitres of boiling *water*. Evaporate the filtrate and washings to dryness and extract the residue

with a mixture of 1 millilitre of N/1 hydrochloric acid, 20 millilitres of *water*, and 5 millilitres of a solution of *sulphurous acid*. Boil the solution until all the sulphur dioxide is expelled, then dilute it to a volume of 50 millilitres with *water*. To 10 millilitres of the solution add 5 millilitres of *hydrogen sulphide*: no change of colour occurs within 10 seconds. To another 10 millilitre portion of the solution add 5 drops of *nitric acid*, heat to boiling, add *ammonia* in excess, again heat to boiling and filter. The addition of 5 millilitres of *hydrogen sulphide* produces only a slight discoloration in 10 seconds and no turbidity within 2 minutes (limit for heavy metals).

Leaves, on incineration, not more than 7·0 per cent. of residue.

Loses, on drying to constant weight at 120°, not more than 10·0 per cent. of its weight.

Shake vigorously 0·1 gramme with 50 millilitres of a *solution of methylene blue* for 1 hour and filter. The filtrate is colourless (limit of adsorptive power).

Dissolve 0·1 gramme of strychnine sulphate in 50 millilitres of *water*, add 1 gramme of Activated Wood Charcoal, shake the mixture vigorously for 5 minutes, filter immediately through a dry filter, and reject the first 20 millilitres of the filtrate. The addition of 1 drop of *hydrochloric acid* and 5 drops *mercuric potassium iodide* to a 10 millilitre portion of the subsequent filtrate produces no turbidity (limit of adsorptive power).

Shake vigorously 0·1 gramme with 25 millilitres of a 1 per cent. w/v solution of *caramel* for 10 minutes and filter. The filtrate is colourless (limit of adsorptive power).

Shake vigorously 0·1 gramme with 25 millilitres of N/10 *iodine* for one hour and filter. Reject the first 10 millilitres of the filtrate and titrate a 10 millilitre portion of the subsequent filtrate with N/10 *sodium thiosulphate*. The volume of thiosulphate required for titration should not exceed 7·5 millilitres (limit of adsorptive power).

Storage. Activated Wood Charcoal should be stored in dry well-closed containers.

DOSES

Metric.	Imperial.
4 to 16 gramme.	60 to 240 grains.

CATECHU NIGRUM

[Catech. Nig.]

Black Catechu

Indian names. Assamese—*Koir*; Bengali—*Khayer*; Gujerathi—*Kherio*; Hindi—*Khair, Kattha*; Kanarese—*Kaggali*; Malayalam—*Kadaram*; Marathi—*Khaderi*; Oriya—*Khodiro*; Santali—*Khaiyar*; Tamil—*Kadiram*.

Black Catechu consists of the dried extract prepared from the heart wood of *Acacia catechu* Willd. (Fam. *Mimosaceæ*).

Characters. In irregular masses or cubes of dark brown to black colour, porous, externally rough, dull to slightly shining masses. Very brittle, breaking into powdery mass. Odourless; taste, bitter and astringent.

A solution, examined microscopically exhibits numerous acicular crystals.

Tests for Identity. Add a few drops of fresh aqueous extract (1 in 10) to about 10 millilitres of *lime water*. A brown colouration, changing to a red precipitate, appears within three minutes.

Tests for Purity. A 10 per cent. w/v aqueous filtered solution gives a dark green colour with a 5 per cent. w/v *solution of ferric chloride;* on making slightly alkaline with a *solution of sodium hydroxide,* the colour changes to purple.

Leaves, when exhausted with cold *water*, not more than 25 per cent. of insoluble residue, dried at 100°.

Leaves, when exhausted with *alcohol (90 per cent.)*, not more than 40 per cent. of insoluble residue, dried at 100°.

Loses, when dried at 100°, not more than 12 per cent. of its weight.

Ash, not more than 8 per cent.

Preparations. Tinctura Catechu Nigri.
Pulvis Catechu Nigri Compositus.

DOSES

Metric.	Imperial.
0·3 to 1 gramme.	5 to 15 grains.

CERA ALBA

[Cera Alb.]

White Beeswax

White Beeswax is Yellow Beeswax decolourized by melting the Beeswax in a casserole, treating with activated carbon, stirring, and subsequent filtration ; or by other suitable means.

Characters. Yellowish-white solid, translucent in thin layers; odour, faint and characteristic.

Tests for Purity. Acid value, 5 to 10 when determined by the method described under ' Cera Flava.'

In other respects White Besswax complies with the tests described under ' Cera Flava.'

CERA FLAVA

[Cera Flav.]

Yellow Beeswax

Indian names. Bengali—*Mom ;* Gujerathi—*Min ;* Hindi—*Mom ;* Kanarese—*Mena ;* Malayalam—*Mezhuka ;* Marathi—*Mena.*

Yellow Beeswax is the purified wax from the honeycomb of the bee, *Apis dorsata* Linn. (Fam. *Apidæ*), and possibly other species of Apis (A. *indica*, A. *florea.*, etc.).

Characters. Yellow Beeswax is a solid varying in colour from yellow to greyish brown ; somewhat brittle when cold, but becoming plastic when warm ; odour, agreeable and honeylike.

Insoluble in *water*, sparingly soluble in cold *alcohol (90 per cent.)* ; soluble in warm *ether*, in *chloroform*, and in fixed and volatile oils.

Tests for Purity. *Specific gravity* (15°/15°), 0·950 to 0·970; *melting point*, 61° to 65°; *refractive index* at 80°, 1·4380 to 1·4480; *acid value*, 6 to 7, as determined by titrating about 5 grammes, accurately weighed, dissolved in 20 millilitres of boiling *dehydrated alcohol* previously neutralised to *phenolphthalein*, with *N/2 alcoholic solution of potassium hydroxide*, using *solution of phenolphthalein* as indicator; *ester value*, 80 to 95 as determined by subtracting the *acid value* from the *saponification value*. The *saponification value* is determined by boiling for one and a quarter hours about 5 grammes, accurately weighed, with 25 millilitres of *N/1 potassium hydroxide in dehydrated alcohol*, and titrating, while hot, with *N/1 sulphuric acid*, using *solution of phenolphthalein* as indicator.

The Ratio Number, *ester value* divided by *acid value*, lies between 11 to 16.

Boil 5 grammes for ten minutes with 80 millilitres of a 10 per cent. w/v aqueous solution of *sodium hydroxide*, replace the water lost by evaporation, cool, filter the solution through glass wool, or asbestos, and acidify with *hydrochloric acid;* the solution does not become turbid (absence of fats, of fatty acids of Japan wax, and of resin).

Boil about 1 gramme for one hour under a water-cooled reflux condenser with 10 millilitres of *N/2 alcoholic solution of potassium hydroxide*, and 10 millilitres of *alcohol* (*95 per cent.*), detach the flask from the condenser, insert a thermometer, and allow to cool, stirring constantly; the liquid does not become cloudy above 61°, but becomes cloudy between 61° and 59° and precipitation of large flocks occurs at not more than 2 degrees below the point at which the liquid becomes cloudy (absence of ceresin, of paraffin, and of certain other waxes).

Storage. Yellow Beeswax should be stored in well-closed containers.

CHINENSIS

[Chinen.]

Chinensis

Synonym. Chinensis Root (Indian Senega).

Indian names. Hindi—*Meradu;* Marathi—*Negli;* Santali—*Gaighura.*

Chinensis is the dried root of *Polygala chinensis* Linn. (Fam. *Polygalaceæ*), collected in autumn from 3 to 4 years old plants.

It contains not more than 5 per cent. of stems and other organic matter.

Characters. Greyish or brownish-yellow twisted roots with a knotty crown, about 1 to 3 centimetres wide consisting of remains of slender aerial stems, buds, and scaly leaves, tap root usually about 10 centimetres long and 1 centimetre wide, bearing one or more spreading lateral roots, usually tortuous with lateral bends; often a shallow spiral keel on the concave side and transverse wrinkles on the convex side; fracture, short. In transverse section, the bark and the cortex occupy a little more than half the radius, free from starch; secondary growth of V-shaped medullary rays. Small globules of oil in all the parenchymatous tissues; starch, calcium oxalate, bast fibres and sclerenchymatous cells absent; medullary rays in the xylem, lignified, and with small vessels. In old roots, pith absent, being occupied by metaxylem. Odour, not characteristic; taste, sweet at first, later acrid.

In powder, fragments of medullary rays; xylem, lignified and with small vessels; starch, calcium oxalate, bast fibres and sclerenchymatous cells absent; fragments of parenchyma containing small globules of oil.

Tests for Purity. *Ash*, not more than 5 per cent.; *alcohol (20 per cent.)-soluble extractive*, not less than 20 per cent.

NOTE. *When senega or its preparations are prescribed, chinensis should be dispensed.*

DOSES

Metric.	Imperial.
0·4 to 0·8 gramme.	6 to 12 grains.

CHIRATA

[Chirat.]

Chirata

Indian names. Bengali—*Chireta*; Hindi—*Charayata*; Kanarese—*Nelabedu*; Marathi—*Chiragita*; Sanskrit—*Kirata-tikta*; Tamil—*Nila vembu*; Telegu—*Nila vem.*

Chirata is the plant *Swertia chirata* Buch. (Ham.) (Fam. *Gentianaceæ*) collected when in flower and dried. It contains not more than 5 per cent. of other organic matter.

Chirata contains not less than 1·3 per cent. of the bitter principles of Chirata.

Characters. Stem, about one metre long, smooth, brown or purplish brown, slightly winged, and much branched above, rounded below and containing a large, contiguous, easily separable pith. Root, small, oblique. Branches, slender, opposite, decussate. Leaves, opposite, ovate, or lanceolate, glabrous, entire, usually with three to seven lateral veins. Flowers small, numerous, panicled. Fruits superior, bicarpellary, unilocular, containing numerous minute reticulated seeds. Odourless; taste, extremely bitter.

Tests for Purity. *Alcohol (60 per cent.)-soluble extractive*, not less than 10 per cent.

An aqueous or alcoholic extract is not coloured blue-black by the addition of *solution of ferric chloride* (absence of tannin).

Acid-insoluble ash, not more than 1 per cent.

Assay. Mix 20 grammes in *No. 60 powder* with boiling water containing 0·5 gramme of *calcium carbonate* and extract with boiling water till the last portion of the extract is devoid of bitterness; concentrate in vacuo and dissolve the residue in hot *alcohol (95 per cent.)*. Filter while hot and wash the residue on the filter with 10 millilitre portions of hot *alcohol* three times; recover the *alcohol* from the filtrate and take up the residue repeatedly with hot water (25, 15, 15, 15 and 15 millilitres). Shake the filtrate repeatedly with 25, 20, 15, 15 and 10 millilitres of *ethyl acetate*; collect the *ethyl acetate* shakings, evaporate, dry and weigh.

Preparations. Infusum Chiratæ Compositum Concentratum.
Tinctura Chiratæ Composita.

DOSES

Metric.	Imperial.
0·6 to 2 grammes.	10 to 30 grains

CHORDA CHIRURGICALIS

[Chor. Chirurg.]

Surgical Gut

Synonyms. Surgical Catgut : Catgut Suture.

CAUTION. *In any part of India in which Chorda Chirurgicalis is controlled by law, care must be taken that the provisions of such law are duly complied with* (*See page* ix).

Surgical Gut consists of sterile gut prepared from the longitudinally split segment of submucous connective tissue of the small intestine of an animal.

Surgical Gut uniformly and firmly twisted is supplied in tubes marked 'Non Boilable' which must not be subjected to heat or 'Boilable' which may be heated for purposes of sterilising the outside of the tube.

Surgical Gut is either plain gut which has not been treated in any manner which will alter its normal rate of digestibility, and is known as *Type A, Plain or Untreated*, or it is gut which has been tanned or otherwise treated so that it will resist digestion for longer but varying periods of time and known respectively as *Type B, Mild Treatment; Type C, Medium Treatment;* and *Type D, Prolonged Treatment.* One form of treatment is frequently referred to as *Chromic Treatment.*

Characters. *Length.* The length of each strand determined immediately after removal from the tube and without any stretching is not less than 90 per cent. of the length stated on the label.

Diameter. Determine the diameter of Surgical Gut immediately after removal from the tube and without stretching as directed under *Diameter of sutures.* The diameter should be determined at three quarterly points of the strands in 12 tubes, which may represent either a single commercial package or which may be drawn at random from a lot. At least 2 of the measurements on each of not less than 10 of the strands shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

SIZE	DIAMETER OF SURGICAL GUT.							
	BOILABLE				NON-BOILABLE			
	Millimeter		Inch		Millimeter		Inch	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
0000000	0·025	0·051	0·001	0·002	0·025	0·064	0·0010	0·0025
000000	0·051	0·102	0·002	0·004	0·064	0·113	0·0025	0·0045
00000	0·102	0·152	0·004	0·006	0·113	0·179	0·0045	0·0070
0000	0·152	0·203	0·006	0·008	0·179	0·241	0·0070	0·0095
000	0·203	0·254	0·008	0·010	0·241	0·318	0·0095	0·0125
00	0·254	0·330	0·010	0·013	0·318	0·406	0·0125	0·0160
0	0·330	0·406	0·013	0·016	0·406	0·495	0·0160	0·0195
1	0·406	0·483	0·016	0·019	0·495	0·584	0·0195	0·0230
2	0·433	0·559	0·019	0·022	0·584	0·673	0·0230	0·0265
3	0·559	0·635	0·022	0·025	0·673	0·762	0·0265	0·0300
4	0·635	0·711	0·025	0·028	0·762	0·864	0·0300	0·0340
5	0·711	0·813	0·028	0·032	0·864	0·978	0·0340	0·0385
6	0·813	0·914	0·032	0·036	0·978	1·105	0·0385	0·0435
7	0·914	1·016	0·036	0·040	1·105	1·219	0·0435	0·0480

Tensile Strength. Determine the tensile strength of Surgical Gut, immediately after removal from the tube and without drying, both on a straight pull and over a surgeon's knot, as directed under *Determination of Tensile Strength of Sutures.* Divide each strand into two parts, and use one part for the straight pull and the other for the surgeon's knot, thus obtaining two breaks on each strand. The minimum tensile strength of each size, calculated on the average strength of 10 strands from any lot, is as follows :—

SIZE	TENSILE STRENGTH OF SURGICAL GUT. Minimum Tensile Strength of Surgical Gut in Avoirdupois Pounds.	
	On Straight Pull.	Over a Surgeon's Knot.
0000000	0·25	0·125
000000	0·5	0·25
00000	1	0·5
0000	2	1·0
000	3	2·0
00	5	3·0
0	7	5·0
1	10	7·0
2	13	9·0
3	16	11·0
4	20	13·0
5	25	17·0
6	30	21·0
7	35	25·0

Tests for Purity. Place 5 grammes as far as possible in whole strands, in 250 millilitres of *water* and set aside for three hours, agitating occasionally. Filter into an evaporating dish, evaporate the filtrate to dryness on a water bath, add 0·25 gramme of mixture of equal parts of *potassium carbonate* and *potassium nitrate* to the dried residue and fuse the mixture. Cool, dissolve the cooled mass in 25 millilitres of *water*. The solution shows no yellow tinge or colour when observed against a white back ground in a colour comparison tube, 25 millimetres in diameter.

Surgical Gut meets the requirements of the *Sterility Tests for solids.*

Labelling. Each tube and each package of Surgical Gut shall indicate the size and type of Gut, whether ' non-boilable ' or ' boilable ' and also the name of the manufacturer. The package shall also indicate the address of the manufacturer, the lot number identifying the method and time of sterilisation of the Gut, and the composition of any tubing fluid used.

CINCHONA FEBRIFUGE

[Cinchon. Febri.]

Cinchona Febrifuge

Cinchona Febrifuge is a mixture of alkaloids from the bark of *Cinchona ledgeriana* (Howard) Mœns et Trimen, *Cinchona succirubra* Pavon, and other suitable species of *Cinchona* (Fam. *Rubiaceæ*). It contains not less than 7 per cent. of anhydrous quinine and not less than 50 per cent. of total crystallisable cinchona alkaloids which is the sum of the percentages of quinine, quinidine, cinchonidine and cinchonine.

Characters. A nearly colourless, pale yellowish-grey, or pale brown powder; odourless; taste, bitter.

Almost insoluble in cold *water*; almost completely soluble in warm *alcohol (95 per cent.)*; partially soluble *in ether*; almost completely soluble in *chloroform*; partially soluble in *benzene*, and in *light petroleum* (boiling-point, 50° to 60°).

A solution in *alcohol (95 per cent.)* is alkaline to solution of litmus.

Tests for Identity. Heated in a dry test-tube, it gradually chars and gives off a strongly alkaline vapour.

A 0·1 per cent. w/v aqueous solution, prepared with the aid of the minimum amount of *dilute sulphuric acid*, shows a blue fluorescence.

To 5 millilitres of a 0·1 per cent. w/v aqueous solution, prepared with the aid of the minimum amount of *dilute sulphuric acid*, add *solution of bromine* until a faint yellow colour is produced, then 1 millilitre of *dilute solution of ammonia*; an emerald-green colour is produced.

Tests for Purity. 0·5 gramme, when dried, first at 70° for one hour, and finally at 100°, loses not more than 0·025 gramme; and leaves, on incineration, not more than 0·025 gramme of residue.

Assay. *For quinine and total crystallisable alkaloids.* Dissolve 2 grammes in a mixture of 20 millilitres of *N/1 sulphuric acid*, 40 millilitres of *water* and 40 millilitres of *alcohol (95 per cent.)*. Heat to boiling, and add *N/10 sodium hydroxide*, keeping the liquid hot during the addition, until the solution is just faintly alkaline to solution of *litmus*. Cool, add *N/10 sulphuric acid* drop by drop, until the solution is slightly acid to *litmus*. Boil for one or two minutes, cool and, if necessary, again render slightly acid to *litmus*; boil, and filter into a tared flask. Wash out the original vessel and the filter with boiling water, until *complete extraction* of the alkaloid is effected, adding the washings to the original filtrate. Evaporate the filtrate, until it weighs about 120 grammes. Add 30 grammes of powdered *sodium potassium tartrate*, shake until dissolved, and set aside for twenty-four hours. Filter off the precipitate through a hardened filter, and wash the flask and filter with 80 millilitres of a 25 per cent. w/v solution of *sodium potassium tartrate* in water, added in portions. Reserve the filtrate and washings. Return the filter with the precipitate to the flask, add 40 millilitres of *solution of sodium hydroxide* and 80 millilitres of *chloroform*, and set aside, shaking from time to time, until complete solution is effected. Separate the chloroform solution, and wash the flask and the aqueous liquid with further portions of *chloroform*, until *complete extraction* of the alkaloids is effected. Wash the mixed chloroform solutions with a little water. Remove the chlorofo rm add 5 millilitres of *alcohol (95 per cent.)*, and evaporate. Dry at 100°, and weigh the residue of quinine and cinchonidine.

Determine the proportion of quinine in the mixture of the two alkaloids by a determination of methoxyl, using 0·2 gramme. 1 per cent. of methoxyl is equivalent to 10·45 per cent. of anhydrous quinine.

Run the filtrate and washings from the precipitated tartrates into a separator, containing 80 millilitres of *ether* and 20 millilitres of *solution of sodium hydroxide*, and shake. Run off the aqueous layer into a second separator, and shake with two further quantities of 80 millilitres of *ether*, each quantity of *ether* being returned to the first separator. Wash the mixed ethereal solutions with a little *water*, and extract the alkaloids by shaking with successive quantities of 10, 10 and 15 millilitres of *N/1 sulphuric acid*, and finally with 10 millilitres of *water*. Run the mixed acid and aqueous liquids into a separator, containing 25 millilitres of *ether* and 30 millilitres of *N/1 sodium hydroxide*, shake, and set aside for one hour. Collect the precipitated cinchonine on a tared filter, using a little *water* to facilitate the complete transfer of the precipitate to the filter; separate the ether from the filtrate, and again run the ether through the precipitate on the filter. Shake the aqueous liquid again with two separate quantities of 25 millilitres of *ether*, and use

these ethereal washings to wash the precipitate. Dry the precipitate at 100°, and weigh the residue of cinchonine. To the weight obtained add 0·08 gramme, in order to correct for loss of cinchonine due to its solubility in ether.

Run the ethereal filtrate from the cinchonine into a separator; wash out the filter-flask with a little *water* and *ether* and add the washings to the liquid in the separator. Separate the aqueous layer, and extract the alkaloid from the ethereal solution by shaking with successive quantities of 10, 10, 5 and 5 millilitres of a 10 per cent. w/w aqueous solution of *glacial acetic acid*, which have been previously used to wash out any alkaloid remaining in the filter-flask or the stem of the funnel. Heat the mixed acid solutions to boiling-point, neutralise with *dilute solution of ammonia*, and add 5 grammes *of potassium iodide*. Allow to stand overnight, and decant the clear supernatant liquid through a filter, warm the precipitate with 5 millilitres of *alcohol (50 per cent.)*, filter off the liquid, and wash the crystalline residue on to the filter with 5 millilitres of *alcohol (50 per cent)*. Dry the precipitate at 100°, and weigh the residue of quinine hydriodide. To the weight obtained add 0·008 gramme, in order to correct for loss of quinidine hydriodide due to its solubility. Each gramme of quinidine hydriodide is equivalent to 0·717 gramme of quinidine.

The sum of the percentages of quinine, cinchonidine, cinchonine and quinidine gives the percentage of total crystallisable cinchona alkaloids.

DOSES

Metric.	**Imperial.**
0·06 to 0·6 gramme.	**1 to 10 grains.**

CINNAMOMUM CASSIA

[Cinnam. Cass.]

Cassia Cinnamon

Indian names. Bengali and Oriya—*Dalchini ;* Malayalam and Tamil—*Lavanga-pattai ;* Punjabi—*Lurundu.*

Cassia Cinnamon consists of the dried stem bark of *Cinnamomum cassia* Blume. (Fam. *Lauraceæ*).

Characters. Simple quills (shavings of bark), 2 to 40 centimetres long and rolled. Outer surface, dull greyish brown, more or less smooth with few transverse wrinkles. Inner surface, reddish brown, fibrous. Fracture, short and uneven. Microscopically, the bark exhibits few layers of cork cells below which lies the light coloured cork cambium layer which is uniformly thick. Phelloderm cells, somewhat sclerenchymatous, rectangular, slightly tangentially elongated. Some of these cells contain starch while others are filled with a dark brown or yellowish oily substance. Stone cells, mucilage cells, and bundles of sclerenchymatous fibres are present. Bast fibres are present near the inner surface. Wood vessels absent. Odour, characteristic, sweet; taste, slightly sweet.

Tests for Purity. *Ash,* not more than 5 per cent.; *acid-insoluble ash,* not more than 2 per cent.

Preparation. Aqua Cassiæ Destillata.

DOSES

Metric.	**Imperial.**
0·3 to 1·2 grammes.	**5 to 20 grains.**

CODEINÆ PHOSPHAS HEMIHYDRAS

[Codein. Phosph. Hemihyd.]

Codeine Phosphate Hemihydrate

$C_{18}H_{21}O_2NH_3PO_4.\frac{1}{2}H_2O$ . . . Mol. Wt. 406·2

Codeine Phosphate Hemihydrate is the phosphate of the alkaloid, codeine, with half a molecule of water. It contains not less than 72·5 per cent., and not more than 74·5 per cent. of anhydrous codeine.

Characters. Fine, white, needle-shaped crystals, or hexagonal prisms, or a white crystalline powder; odourless; taste, bitter. Loses water of hydration on exposure to air; changes colour on exposure to light; soluble in 3·5 millilitres of water and 350 millilitres of *alcohol (90 per cent)*; sparingly soluble in ether and chloroform. An aqueous solution (1 in 20) is acid to *litmus*.

Tests for Identity. A 2 per cent. w/v solution in *water*, acidified with *dilute hydrochlorid acid*, yields no precipitate with *dilute solution of ammonia*, but becomes turbid with *solution of sodium hydroxide*, the oily precipitate first formed becoming crystalline on standing (distinction from morphine).

Place a little, in powder, on the surface of a drop of *nitric acid*; a yellow, but not red, colour is produced (distinction from morphine).

Dissolve about 0·1 gramme in 1 millilitre of *sulphuric acid*, add 1 drop of *test-solution of ferric chloride*, or of *solution of ammonium molybdate*, and warm gently; a bluish-violet colour is produced, which is changed to red by a drop of *dilute nitric acid*.

Yields *reactions* characteristic of phosphates. Sulphuric acid containing 5 milligrammes of *selenous acid* in each millilitre produces with codeine phosphate, a green colour, which rapidly changes to blue, then slowly back to green.

Tests for Purity. To 5 millilitres of a 2 per cent. w/v solution in *N/10 hydrochloric acid* add 2 millilitres of a 1 per cent. w/v solution of *sodium nitrite* in *water*, and then 3 millilitres of *dilute solution of ammonia*; the yellow colour produced is not deeper than that obtained, when 5 millilitres of a 0·002 per cent. w/v solution of *anhydrous morphine* in *N/10 hydrochloric acid* is similarly treated (limit of morphine).

0·5 gramme complies with the *limit test for chlorides*, and with the *limit test for sulphates*.

0·2 gramme loses, when dried at 100°, not less than 0·003 gramme, and not more than 0·006 gramme.

Assay. Dissolve about 0·5 gramme of codeine phosphate hemihydrate accurately weighed in 10 millilitres of *water* in a separator and extract with 10 millilitres of *chloroform*. Transfer the chloroform extract to a second separator and wash with 5 millilitres of *water*. Add the washings to the first separator, and then 10 millilitres of *N/1 Sodium Hydroxide* and extract the codeine with four successive portions of 15, 10, 10 and 5 millilitres of *chloroform*. Shake the combined chloroform extracts with 5 millilitres of *water*, and completely remove the chloroform layer to a dry flask and evaporate almost to dryness on a water bath, dissolve the residue by warming with

15 millilitres of *N/10 sulphuric acid*, heat the solution until it no longer has a perceptible smell of chloroform, cool, dilute with 10 millilitres of *water* and titrate the excess acid with *N/10 sodium hydroxide* using 2 drops of *methyl red solution* as indicator. Each millilitre of *N/10 sulphuric acid* is equivalent to 0·02994 gramme of anhydrous codeine ($C_{18}H_{21}O_3N$).

Storage. Codeine Phosphate should be kept in a well-closed container, protected from light.

DOSES

Metric.	**Imperial.**
0·016 to 0·06 gramme.	**1/4 to 1 grain.**

COLCHICI CORMUS

[Colch. Corm.]

Colchicum Corm

Indian names. Hindi—*Suringam ;* Punjabi—*Surinjan-i-talkh ;* Sanskrit—*Hiranyatutha.*

Colchicum Corm is the fresh corm of the bitter variety of *Colchicum luteum* Baker. (Fam. *Liliaceæ*) collected in June and July before flowering commences ; or the same deprived of its coats, sliced transversely, and dried at a temperature not exceeding 65°.

It contains not more than 2 per cent. of other organic matter, and the dried corm, not less than 0·20 per cent. of colchicine.

Characters. Fresh corm, 15 to 35 millimetres long, 10 to 20 millimetres in diameter, somewhat conical, rounded on one side, flattened on the other with a groove in the middle running throughout the length of the corm from which daughter corms develop ; membranous coat absent ; fibrovascular bundles visible as fine longitudinal strands running on and within the corm. Dried corm, hard, surface smooth, light or deep brown, breaking easily with a short mealy fracture ; cut surface, white and starchy, showing vascular strands as small grey points. Microscopically, large parenchymatous cells, full of starch ; starch grains, simple, or compound with 2-3 or more components, mostly of angular form ; hilum, stellate ; diameter, from 5 microns to 30 microns. Epidermis, of one layer of more or less rectangular cells. Below, cells polygonal. Fibrovascular bundles contain spiral tracheids and sclerenchymatous fibres. Bundles, small with tracheids mostly in a single line surrounded by fibres. Calcium oxalate crystals, absent. Odourless ; taste, bitter and acrid.

Assay. Carry out the Assay as directed under 'Colchici Semen'. To the weighed residue add 10 millilitres of *water* and allow to stand for a few minutes. Filter through a small filter, wash the dish and filter with further small quantities of *water* until complete extraction of the alkaloid is effected. Dissolve any insoluble matter on the filter in a little *alcohol (95 per cent.)*, transfer to the dish containing the remainder of the insoluble matter,

evaporate, dry at 100°, and weigh. In order to obtain the weight of colchicine in the colchicum corm being tested, subtract the weight, so obtained, from the weight of the residue, previously determined in the Assay as directed under 'Colchici Semen'.

Storage. Colchicum Corm should be stored in dry well-closed containers.

Preparation. Extractum Colchici Siccum.

DOSES

(of the dried corm.)

Metric.	Imperial.
0·12 to 0·3 gramme.	2 to 5 grains.

COLCHICI SEMEN

[Colch. Sem.]

Colchicum Seed

Colchicum Seed consists of the dried ripe seeds of the bitter variety of *Colchicum luteum* Baker. (Fam. *Liliaceæ*). It contains not more than 2 per cent. of other organic matter, and not less than 0·3 per cent. of colchicine.

Characters. Brownish white, ovoid or irregularly globular, 2 to 3 millimetres in diameter, minutely pointed at the hilum and with a distinct beak or caruncle approximately opposite to the hilum. Compressed on two or more sides. Fresh seeds cohere in small lumps. Boiled seeds look dark brown, with somewhat pitted appearance. Testa consists of a few layers of brown cells separable when boiled. Tegmen remains attached to the seed and is reddish brown in colour. Microscopically, the endosperm parenchyma is made of very thick porous walled cells containing fixed oil and aleurone grains. Starch, absent. Aleurone grains measure 3 to 15 microns in diameter. Embryo, very small. Odourless; taste, bitter.

Test for Purity. *Ash,* not more than 3 per cent.

Assay. Mix 20 grammes in *coarse powder* with 30 millilitres of *alcohol (95 per cent.)*, and heat on a water-bath for about fifteen minutes. Transfer to an apparatus for *continuous extraction* and extract with *alcohol (90 per cent.)* for three hours. Cool the extract, set aside for half an hour, and filter, washing the filter with *alcohol (90 per cent.)*, until *complete extraction* of the alkaloid is effected. Evaporate the filtrate to dryness on a water-bath, wash the residue into a separator with 20 millilitres of a 20 per cent. w/v aqueous solution of *sodium sulphate* and 50 millilitres of *ether,* shake well, allow to separate and run the lower layer into a second separator, containing 50 millilitres of *ether,* again shake well, and separate. Wash the dish with a further 5 millilitres of 20 per cent. w/v aqueous solution of *sodium sulphate,* transfer to the first separator, shake, separate, run into the second separator, shake and again separate. Repeat the washing of the dish and contents of the two separators in the same manner with a further 5 millilitres of the solution of *sodium sulphate* and then with three portions of 5 millilitres each of *water.* Mix all the aqueous liquids, heat on a water-bath until the ether is completely expelled, cool add 0·2 gramme of *powdered talc.* and make up to 50 millilitres with the solution of *sodium sulphate.* Set aside for about an hour, shaking frequently, and filter, rejecting the first 5 millilitres of the filtrate. Take 40 millilitres of the filtrate, representing 16 grammes of the colchicum seed being assayed, shake with 40 millilitres of *ether,* separate and wash the *ether* with three successive portions of 5

millilitres each of *water*. Mix the aqueous liquids, add 50 millilitres of *chloroform* and shake, add 2 millilitres of *N/1 sodium hydroxide*, and again shake well. Run off the lower layer into a second separator, containing 2 millilitres of *N/10 sodium hydroxide* and 15 millilitres of *water*, shake, separate, and filter the chloroform solution through a double filter. Continue the extraction with further portions of chloroform, washing each portion with the alkaline liquid contained in the second separator, and filtering as before. Remove the *chloroform*, add 2 millilitres of *alcohol (95 per cent.)*, evaporate, add a further 2 millilitres of *alcohol (95 per cent.)*, evaporate, dry at 100°, and weigh the residue.

Storage. Colchicum seeds should be stored in well-closed containers.

Preparations. Extractum Colchici Liquidum.
Tinctura Colchici.

DOSES

Metric.	Imperial.
0·12 to 0·3 gramme.	2 to 5 grains.

COLCHICINA

[Colchicin.]

Colchicine

$C_{22}H_{25}O_6N$ . . . . Mol. Wt. 399·43.

Colchicine is an alkaloid obtained from *Colchicum luteum* Baker. (Fam. *Liliaceæ*).

Characters. Pale yellow, amorphous scales or powder darkening on exposure to light. Almost odourless; taste, bitter.

A solution in water is lævorotatory.

Soluble in *water*; freely soluble in *alcohol*, and in *chloroform*; sparingly soluble in *ether*.

The melting point of colchicine, dried over sulphuric acid for 24 hours, lies between 142° to 150°.

Tests for Identity. A 3 per cent. w/v aqueous solution is yellow; the colour is intensified by the addition of inorganic acids.

Mix 1 milligramme with a few drops of *sulphuric acid;* a lemon yellow colour is produced but on the addition of a drop of *nitric acid*, the colour changes to greenish blue, rapidly becoming reddish and finally yellow or almost colourless. The colour is changed to red on the addition of an excess of *N/10 sodium hydroxide* solution.

One drop of *solution of ferric chloride* added to 1 millilitre of 5 per cent. w/v alcoholic solution of colchicine, produces a garnet red colour at once.

Tests for Purity. Loses, when dried over *sulphuric acid* for 18 hours, not more than 2 per cent. of its weight.

Heat a mixture of about 10 milligrammes with 2 millilitres of *N/10 sodium hydroxide* and 1 drop of *aniline*. No odour of phenylisocyanide is developed.

Ash, from 0·1 gramme is negligible.

Storage. Colchicine should be stored in air tight, light-resistant containers.

DOSES

Metric.	Imperial.
0·00025 to 0·001 gramme.	1/240 to 1/60 grain.

COLOPHONIUM

[Coloph.]

Colophony

Synonyms. Resina : Resin : Rosin.

Colophony is the solid residue left after distilling the volatile oil from the oleo-resin, obtained from *Pinus longifolia* Roxb. and other species of *Pinus*.

Characters. Translucent, pale yellow or brownish-yellow, angular, brittle, glassy masses. Odour and taste, faintly terebinthinate.

Insoluble in water; soluble in *alcohol (90 per cent.)*, in *ether*, in *benzene*, and in *carbon disulphide*; partially soluble in *light petroleum (boiling point. 50° to 60°)*. Readily fusible.

Tests for Identity. Dissolve 0·1 gramme in 10 millilitres of *acetic anhydride* by gentle heat, cool, and add one drop of *sulphuric acid*; a bright purplish red colour, rapidly changing to violet, is produced.

Shake 0·1 gramme in powder with 10 millilitres of *light petroleum (boiling point, 50° to 60°)*, and filter; shake 5 millilitres of the filtrate with 10 millilitres of *dilute solution of copper acetate*; the petroleum solution assumes a bright bluish-green colour.

Tests for Purity. *Specific gravity* (15·5°/15·5°), 1·064 to 1·082; *melting point*, 75° to 85°; *saponification value*, 188-192; acid value, not less than 150.

Ash, not more than 0·125 per cent.

Preparation. Emplastrum Colophonii.

CRETA

[Cret.]

Chalk

Synonyms. Creta Præparata : Prepared Chalk.

Chalk is a native form of calcium carbonate, freed from most of its impurities by elutriation. It contains not less than 97 per cent. of $CaCO_3$, calculated with reference to the substance dried at 100°.

Characters. White, or greyish-white, friable masses or powder; microscopically, consists of the entire and broken testas of cretaceous foraminifera such as *Globigerina* (about 35 by 30 to 140 by 115 microns), and *Textularia* (about 50 by 40 to 175 by 110 microns), and minute rounded, ovoid or flattened morpholites (about 10 to 15 microns in diameter). Odourless and tasteless.

Almost insoluble in *water*; soluble with effervescence in *hydrochloric acid*.

Tests for Identity. Yields the reactions characteristic of calcium, and for carbonates.

Tests for Purity. 1 gramme, boiled with 50 millilitres of *water* and filtered, yields a filtrate which is neutral to solution of *litmus*.

Dissolve 2 grammes in 5 millilitres of *hydrochloric acid* and 25 millilitres of *water*, boil to remove carbon dioxide, make alkaline with *dilute solution*

of ammonia, filter, and wash; the residue after ignition weighs not more than 0·04 gramme (limit of aluminium, iron, phosphate and matter insoluble in hydrochloric acid).

1 gramme, dissolved in 2 millilitres of *nitric acid* and 10 millilitres of *water* and filtered, complies with the *limit test for chlorides*.

1 gramme, dissolved in 2·5 millilitres of *hydrochloric acid* and 10 millilitres of *water* and filtered, complies with the *limit test for sulphates*.

Mount a sample in solution of *chloral hydrate* on a glass slide and warm gently; crystalline or semi-crystalline structures shall not be seen when examined under a microscope (absence of precipitated chalk, of powdered calcite, or of marble).

Arsenic limit, 5 parts per million. *Lead limit*, 20 parts per million.

Loses, when dried at 100°, not more than 1 per cent. of its weight.

Assay. Dissolve about 2 grammes, accurately weighed, in 50 millilitres of *N/1 hydrochloric acid* and 100 millilitres of *water* and titrate the excess of acid with *N/1 sodium hydroxide*, using *solution of methyl orange* as indicator. Each millilitre of *N/1 hydrochloric acid* is equivalent to 0·05004 gramme of $CaCO_3$.

Preparations. Pulvis Cretæ Aromaticus.
Pulvis Cretæ Aromaticus cum Opio.

DOSES

Metric.	Imperial.
1 to 4 grammes.	15 to 60 grains.

CROCUS

[Croc.]

Crocus

Synonym. Saffron.

Indian names. Bengali—*Jafran;* Gujerathi—*Keshar;* Hindi—*Kesar, Zafran;* Marathi—*Keshar;* Sanskrit—*Kunkuma;* Tamil—*Kungumapu;* Telegu—*Kunkumapuvu.*

Crocus is the dried stigma of *Crocus sativus* Linn. (Fam. *Iridaceæ*). It contains not more than 10 per cent. of styles of the plant and not more than 2 per cent. of other organic matter.

Characters. Stigmas, three, attached to the apex of the style or separate; about 25 millimetres long, cormucopia-shaped, or dark red to pale reddish brown colour, the margin dentate or fimbriate; styles, about 10 millimetres long, more or less cylindrical, solid, yellowish brown to yellowish orange. Microscopically, stigma composed mostly of elongated thin-walled parenchyma cells containing colouring matter; at the upper end numerous cylindrical papillæ or trichomes up to 150 microns long; pollen grains, few, spherical, nearly smooth, from 40 to 120 microns in diameter, occasionally germinated and exhibiting pollen tubes. Odour, strong, characteristically aromatic; taste, bitterish and aromatic.

Tests for Identity. The stigmas, when dropped in *sulphuric acid*, immediately turn blue, gradually changing to purple and finally purplish red.

Tests for Purity. Loses, on drying at 100°, not more than 14 per cent. of its weight.

Digest about 0·1 gramme in 10 millilitres of *water* for 15 minutes with frequent shaking, filter and add 1 gramme of *decolourising charcoal* to the filtrate; shake and allow to stand for 10 minutes; filter. The filtrate is colourless (limit of organic dyes).

Macerate 10 milligrammes in 5 millilitres of *alcohol* (*95 per cent.*) or *methyl alcohol*; a distinct greenish yellow colour is imparted to the liquid; with corresponding quantities of Crocus and *ether* and *chloroform* the solvents remain almost colourless; with *xylene, benzene* and *carbon tetrachloride* the solvents remain colourless (limit of organic dyes).

Press between clear filter paper, the paper does not display translucent oily spots (limit of fixed oil or glycerin).

Assay. Weigh accurately 0·1 gramme in *moderately fine powder*, and macerate at room temperature in 100 millilitres of *water* for three hours with frequent shaking. Filter immediately, adding sufficient *water* through the filter to make 100 millilitres. Dilute 10 millilitres of this filtrate, accurately measured, to 100 millilitres with *water*. Immediately compare the colour of this solution in Nessler tubes or in a colorimeter, with the colour of *N/100 potassium dichromate*. The colour of the solution approximates that of the *N/100 potassium dichromate*, and the strength of the colour is not less than that of an equal depth in millimetres of the *N/100 potassium dichromate*.

STORAGE. Crocus should be preserved in well-closed containers, protected from light.

CUMINUM

[Cumin.]

Cumin

Indian names. Bengali—*Jira*; Gujerathi—*Jiraugi*; Hindi—*Zira*; Kanarese—*Jiruige*; Malayalam—*Jiragam*; Marathi—*Jeregire*; Sanskrit—*Jiraka*; Tamil—*Shiragam*; Telegu—*Jiraka*.

Cumin is the ripe fruit of *Cuminum cyminum* Linn. (Fam. *Umbelliferæ*). It contains not more than 2 per cent. of other foreign organic matter.

Characters. Fruit, a cremocarp, brown in colour, with lighter coloured ridges, elongated oval shape, about 4 to 6 millimetres long, tapering onwards both base and apex. Mericarps, generally separate, each having five longitudinally hairy primary ridges running from base to apex; alternating with these are secondary ridges which are flatter and bear conspicuous emergences. Microscopically, the transverse section of the mericarp exhibits an oily endosperm and six vittæ, four being on the dorsal surface and two on the commissural surface; the large pluriserial hairs are characteristic. Odour, characteristic; taste, characteristic resembling those of anise.

Test for Purity. *Ash*, not more than 8 per cent.

DOSES

Metric.	Imperial.
0·3 to 0·6 grammes.	5 to 10 grains.

CUPRI ACETO-ARSENITUM

[Cupr. Aceto-Arsen.]

Aceto-Arsenite of Copper : Vienna Green

Synonyms. Imperial Green : Paris Green.

Aceto-arsenite of Copper has the approximate composition $3Cu(AsO_2)_2 . Cu(C_2H_3O_2)_2$, and contains not less than 50 per cent. and not more than 58 per cent. of arsenious oxide, calculated as As_2O_3, and not less than 30 per cent. and not more than 33 per cent. of copper oxide, calculated as CuO.

Not less than 99·0 per cent. of the material shall pass through a *No. 200 Sieve.*

Characters. Brilliant bluish green or deep green fine powder. Almost insoluble in water; completely soluble in weak acids.

Tests for Identity. A solution of Paris Green in weak acids gives the reactions for copper and arsenic.

Assay. *For arsenic.* Weigh accurately about 1·50 grammes of the sample and wash into a 250 millilitre flask with 100 millilitres of a solution of hydrochloric acid made of 1 part of *hydrochloric acid* diluted to 5 parts with *water.* Heat to a maximum of 90°, if necessary, to secure complete solution of the sample. Cool and make up to volume with the *dilute hydrochloric acid.* Shake well and transfer 50 millilitres to a 500 millilitre Erlenmeyer flask, add 10 millilitres of *hydrochloric acid* and titrate with *standard bromate solution* using *solution of methyl orange* as indicator. 1 millilitre of *standard bromate solution* is equivalent to 0·003 gramme of As_2O_3.

For copper. Treat 2 grammes of the sample in a beaker with 100 millilitres of *water* and approximately 2 grammes of *sodium hydroxide* and boil until all the copper is precipitated as Cu_2O. Filter, wash well with hot *water*, dissolve the precipitate in a hot solution of nitric acid made of 1 part of *nitric acid* and 4 parts of *water* . cool and add sufficient *water* to produce 250 millilitres. Boil 25 millilitres of the solution to drive off excess of nitric acid; dilute to 50 millilitres with *water* and make distinctly alkaline with *solution of ammonia.* Boil until excess of ammonia is expelled, as shown by change of colour and partial precipitation, and add 3 to 4 millilitres of *acetic acid* and boil again. Cool and add 10 millilitres of a 30 per cent. *potassium iodide* solution and titrate with *N/10 sodium thiosulphate,* using *mucilage of starch* as indicator. 1 millilitre of *N/10 sodium thiosulphate* is equivalent to 0·007957 gramme of CuO.

Storage and Packing. Paris Green should be stored in sound wide mouthed tinplated containers. Each container shall be conspicuously labelled with the name of the material and the word POISON.

NOTE. *Intended for use as an insecticide.*

DERRIS

[Derr.]

Derris

Synonym. Indian Tuba Root.

Indian names. Cachari—*Ruphang-doukha.*

Derris consists of dried rhizomes and roots of *Derris ferruginea* Benth. (Fam. *Papilionaceæ*) collected from two years old plants.

It contains not more than 2 per cent. of other organic matter and not less than 2 per cent. of rotenone.

Characters. Roots, often attached to short pieces of rhizomes, up to 2 meters in length and 2 centimetres in width, flexible and hard. Externally of light greyish colour with fine longitudinal wrinkles and some transverse broken rings formed of lenticels. Internally, the wood is uniformly of light yellow colour. The transverse section exhibits a narrow bark of somewhat deeper colour and a pale cream coloured wood containing mostly fibres. Large number of starch grains present in most of the tissues of wood, particularly in the medullary rays. Pith, almost absent. In powder, light yellow, containing large number of starch grains mostly 3 to 4—compound, and fragments of wood fibres, vessels and tracheids. Parenchymatous cells are almost absent. Bark, contains rectangular cells with few stone cells and fibres in the secondary phloem. Odour, slight, aromatic; taste, none but produces a feeling of numbness when chewed.

Tests for Purity. *Ash*, not more than 6 per cent.; *acid-insoluble ash*, not more than 2 per cent.

Assay. Extract about 50 grammes in *No. 60 powder*, accurately weighed, by *continuous extraction* with *carbon tetrachloride* for at least twelve hours. Evaporate the extract to about 25 millilitres and transfer while still hot to a flat-bottomed glass dish, washing the flask with 5 millilitres of warm *carbon tetrachloride* and adding the washings to the dish. Cover the dish and set aside in a cool place to allow the rotenone-carbon tetrachloride compound to crystallise, hastening the crystallisation, if necessary, by seeding with a small crystal of rotenone and cooling the solution by means of ice. Transfer the crystals to a tared Gooch crucible, wash with 20 millilitres of ice-cold *carbon tetrachloride*, remove the excess of solvent as far as possible by suction, and allow the crystals to dry spontaneously or in an air oven at a temperature not exceeding 40°, and weigh. Each gramme of the crystals is equivalent to 0·719 gramme of rotenone.

Storage. Derris should be stored in closed containers.

Preparation. Applicatio Derridis.

DICHLORO-DIPHENYL-TRICHLOROETHANUM PURUM

[D. D. T. Pure]

Pure Dichloro-Diphenyl-Trichloroethane

Synonym. Pure D. D. T.

$C_{14}H_9Cl_5$ . . . . Mol. Wt. 354·5

D. D. T. is p.p′-dichloro-2 : 2-diphenyl-1 : 1 : 1-trichloroethane, and may be prepared by the action of concentrated Sulphuric acid on a mixture of one part of Chloral and two parts of Monochlorbenzene and the product purified by repeated crystallisation.

Characters. White needle-shaped crystals or crystalline powder.

Insoluble in *water*, slightly soluble in cold *alcohol (90 per cent.)* and in *acetic acid*. Dissolves readily in hot *alcohol (90 per cent.)*, in *chloroform*, and in *ether*; highly soluble in *carbon disulphide*.

Dissolve 1 gramme of the sample in 2·5 millilitres of *neutral acetone*, add 7·5 millilitres of *water* and titrate immediately with *N/50* Sodium hydroxide using *methyl red* as indicator. Not more than 0·5 to 1·0 millilitre is required for complete neutralisation (limit of acidity).

Dissolve 0·1 gramme of the sample into a 50 millilitre flask containing 10 millilitres *N/10 alcoholic caustic potash* and gently reflux on water bath.

On cooling add sufficient 2N Nitric acid to make acid. A copious precipitate is noticed on addition of *silver nitrate* (presence of hydrolysable chlorine).

Loses, when dried at 80°, not more than 1 per cent of its weight (limit of volatile matter, including moisture).

Storage. Pure D. D. T. should be stored in sound, clean, dry kegs or suitable containers.

DICHLORO-DIPHENYL-TRICHLOROETHANUM TECHNICUM

[D. D. T. Tech.]

Technical Dichloro-Diphenyl-Trichloroethane

Synonym. Technical D. D. T.

Technical D. D. T. contains not less than 50 per cent. of p.p.'-dichloro-2 : 2-diphenyl-1 : 1 : 1-trichlorœthane.

Characters. White or nearly white needle-shaped crystalline powder or small granules.

Insoluble in *water*, slightly soluble in cold *alcohol (90 per cent.)*, and in *acetic acid*. Dissolves readily in hot *alcohol (90 per cent.)*, in *chloroform*, and in *ether* ; highly soluble in *carbon disulphide*.

Tests for Purity. The setting point is not less than 70° as determined by the following method :—

Melt very carefully, sufficient of the sample, in a 8″×1″ boiling tube, to give a depth of liquid of 2″ to 3″, either in a boiling water bath or in an oil bath a temperature not greater than 110°. If hydrogen chloride is evolved during the melting another portion of the sample must be taken and melted at a lower temperature. Insert this boiling tube, by means of a cork collar, to within ½″ of the bottom of the second boiling tube size 6″×1½″. Immerse to depth of 4″ in a water bath maintained at 70°. Place in the inner boiling tube a stirrer bent to fit round a thermometer clamped in a central position with its bulb well below the surface of the molten sample. Stir at the rate of about two strokes per second until the material has solidified to a thick mush. If solidification has not commenced at a temperature of 72°, reduce the temperature of the water bath to 65° and continue stirring until a thick mush is obtained. Then stop stirring and record the highest steady temperature as the settling point of the sample.

The acidity of technical D. D. T. expressed as sulphuric acid is not more than 0·3 per cent. as determined by the following method :—

Dissolve 10·0 grammes of the sample in 25 millilitres of *acetone* by gentle warming, if necessary. Add 75 millilitres of *water* and titrate immediately with *N/50 sodium hydroxide* using screened methyl red as indicator. Carry out a blank determination on 25 millilitres of *acetone* and 75 millilitres of *water*. The difference between the two readings multiplied by 0·0098 represents the percentage of acidity as sulphuric acid.

The hydrolysable chlorine content of the material must not be less than 9·5 per cent. or greater than 11 per cent. as determined by the following method :—

Accurately weigh approximately 0·5 gramme (" w " gramme) of the sample into a 250 millilitre flask. Add 40 millilitres of *N/10 alcoholic potassium hydroxide*, and gently reflux for half an hour. Wash down the condenser

with *water* and allow to cool. Add 20 millilitres of *2N nitric acid*, exactly 25 millilitres of *N/10 silver nitrate*, 5 millilitres of *nitrobenzene* and 5 millilitres of *solution of ferric alum*. Back titrate with *N/20 potassium thiocyanate* (factor 'f', titre 'a' millilitre). The end point is the appearance of the red ferric thiocyanate colour. Carry out a blank determination on the reagents used in exactly the same way (titre 'b' millilitre of *N/20 potassium thiocyanate*). The percentage of hydrolysable chlorine is equivalent to $\frac{(b-a)\times f\times 0{\cdot}1775}{w}$.

Content of volatile matter, including water, immiscible with *petroleum ether*, not more than 1 per cent.

Assay. Weigh 10·0 grammes of the material in a 100 millilitre beaker and add 50 millilitres of *dehydrated alcohol* saturated with pure *p.p′-dichloro-2 : 2-diphenyl-1 : 1 : 1-trichlorœthane* of melting point not less than 106°. Cover the beaker with a watch glass and very carefully heat the contents to boiling point effecting solution of the contents without loss of *alcohol*. Cool to 20° to 25° for 1 hour, and then complete the crystallisation at 15° to 18° for a further period of 1 hour. Filter by suction on a weighed No. 3 sintered glass crucible, press the crystals down with a flat-end glass rod and wash the beaker, glass rod and crystals with two 10 millilitre portions of the *alcohol* saturated with pure *p.p′-dichloro 2 : 2-diphenyl-1: 1 : 1-trichlorœthane*. Continue suction for 5 minutes and dry the crucible and contents to constant weight at 80°. If the weight of crystalline product is 'w' gramme, the *p.p′-dichloro-2 : 2-diphenyl-1 : 1 : 1-trichlorœthane* content is 10 'w' per cent.

To prepare the saturated alcoholic solution, dissolve about 60 grammes of the pure *p.p′-dichloro 2 : 2-diphenyl-1 : 1 : 1-trichlorœthane* of melting point not less than 106°, in 500 millilitres of *hot dehydrated alcohol*. Pour the solution into one and half litres of *absolute alcohol* and add 1 gramme of solid pure reagent. Allow to stand overnight at 15° to 18° before using. *Industrial Methylated Spirit* 70 O.P. may be used instead of *dehydrated alcohol*.

Storage. Technical D. D. T. should be stored in sound, clean, dry kegs or other suitable containers.

EMPLASTRUM SINAPIS

[Emp. Sinap.]

Mustard Plaster

Mustard Plaster is a uniform mixture of powdered Black Mustard, deprived of its fixed oil, and a solution of a suitable adhesive, spread on paper, cotton cloth, or other suitable backing material.

Each 10 square inches of spread plaster contains not less than 150 grains of Black Mustard deprived of its fixed oil.

When moistened thoroughly with tepid water (temperature not exceeding 45°) and applied to the skin, Mustard Plaster produces a decided warmth and reddening of the skin within 5 minutes.

Storage. Mustard Plaster should be stored in well-closed containers preferably at a temperature not above 35°, and protected from direct sunlight.

NOTE. *Before application, Mustard Plaster should be thoroughly moistened with tepid water (temperature not exceeding 45°C.).*

EPHEDRA

[Ephed.]

Ephedra

Synonym. Ma-Huang.

Indian names. Punjabi—*Amsania, Chewa.*

Ephedra consists of dried stem of *Ephedra gerardiana* (Wall.) Stapf. and also of *E. nebrodensis* (Tineo.) Stapf. (Fam. *Gnetaceæ*), collected in autumn.

Ephedra contains not less than 1·00 per cent. of total alkaloids, calculated as Ephedrine ($C_{10}H_{15}ON$, Mol. wt. 165·1).

Characters. Stems, greenish, cylindrical, woody, gnarled; branchlets, cylindrical, green main branches having internodes of about 3 to 3·5 centimetres long and 5 millimetres in diameter. Branching, decussate and opposite, whorls of branchlets from nodes; internodes of branchlets 1 to 2·5 centimetres long and 1 to 2 millimetres in diameter. Scale leaves, subulate, usually in whorls of 2 from each node; bases dark brown and joined on all sides of the node forming a sheath ½ to 1 millimetre long. Terminal bud, short, usually constricted at the base. Male spikes, ovate, solitary or few, sessile, crowded. Female cone, 1-2 fid, innermost bracts scarcely connate to the middle. Fruit, long, ovoid, red, sweet, edible. Seeds, exserted. Odour, heavy, aromatic, pine-like; taste, strong, astringent. Microscopically, epidermis of one layer of straight walled rectangular cells whose outer walls are ridged. Stomata, sunken between the slightly lignified ridges. Bundles (of 6 to 15 thick walled cells) of non-lignified fibres below each ridge. Cortex comparatively broad, of several layers of parenchymatous cells, radially elongated, except the endodermal layer. Numerous small crystals in the cortical region. Pericycle, of non-lignified fibres, in scattered groups of 2 to 6, especially at the tops of primary phloem. In mature stem the xylem forms a complete ring, mostly developed, a little less on one side. Xylem, mostly of tracheids with bordered pits, vessels absent. Primary xylem bundles as wedges inside the pith. Pith, large, of large rounded parenchymatous cells with intercellular spaces, scattered fibres (1-3 in a group), some containing a reddish mucilaginous substance.

Ephedra, in powder, contains the constituents and possesses the diagnostic microscopical characters of Ephedra, and complies with the standard for the unground drug.

Assay. Introduce 10 grammes in *No. 40 powder* into a stoppered flask, add 100 millilitres of a mixture of three volumes of *ether* and one volume of *chloroform* and shake well for ten minutes. Add 10 millilitres of *dilute solution of ammonia* and shake at frequent intervals for three hours. Allow the mixture to stand overnight. Transfer the mixture to a small percolator plugged with *absorbent cotton*. When the liquid ceases to flow, pack firmly and continue the percolation with ether-chloroform mixture (3 :1) until *complete extraction* is effected. Transfer the combined extract to a separating funnel, add 40 millilitres of *N/2 sulphuric acid*, shake well and allow to separate. Filter the lower layer through *absorbent cotton* into a second separating funnel, and continue the extraction of the alkaloid with successive portions of 25, 20, 20, 15 millilitres of *N/10 sulphuric acid* until *complete extraction* of the alkaloid is effected. Filter each of the extracts through the same *absorbent cotton* into the second separator. Finally wash the *absorbent cotton* filter with 5 millilitres of *N/10 sulphuric acid* and mix the washing with the acid

aqueous extract. Saturate the acid aqueous extract with *sodium chloride*, make distinctly alkaline with *dilute solution of ammonia* and shake with successive portions of 40, 25, 20, 20, 15 millilitres of *ether* until *complete extraction* of the alkaloid is effected. Wash the combined ethereal extract with 5 millilitres of a saturated solution of *sodium chloride*. Reject the *sodium chloride* solution. Filter the ethereal layer through dry *absorbent cotton* into a flask. Wash the filter with 5 millilitres of *ether* and mix with the original filtrate. Remove the *ether* and dissolve the residue in 20 millilitres of *N/10 sulphuric acid*, and 20 millilitres of *water* and titrate the excess of acid with *N/10 sodium hydroxide* using *solution of methyl red* as indicator. Each millilitre of N/10 acid is equivalent to 0·01651 gramme of total alkaloids calculated as ephedrine $C_{10}H_{15}ON$.

Storage. Ephedra should be stored in dry well-closed containers.

Preparations. Extractum Ephedræ Liquidum.
Tinctura Ephedræ.

ERGOTA

(**Ergot.**)

Ergot

Synonym. Ergot of Rye.

Ergot is the dried sclerotium of *Claviceps purpurea* (Fries.) Tulasne. (Fam. *Hypocreaceæ*) developed on rye plants *Secale cereale* Linn. It contains not more than 2 per cent. of seeds, fruits and other foreign organic matter, and not less than 0·1 per cent. of the total alkaloids of Ergot, calculated as ergotoxine, of which not less than 7 per cent. In case of ergot of higher consists of water-soluble alkaloids of Ergot, calculated as ergometrine or lower alkaloidal contents, the strength should be adjusted by the admixture in suitable proportions of ergot having lower or higher alkaloidal content.

Characters. Dark violet to nearly black; usually from about 1 to 3 centimetres long and from 1 to 5 millimetres broad, fusiform, obscurely 3-angled, usually tapering towards both ends, often with a longitudinal furrow on each face and transversely cracked; brittle; fracture, short; internally whitish or pinkish-white, and showing darker lines radiating from the centre. Outer region, thin, of a few layers of dark purple to dark brown, collapsed cells in regular longitudinal rows; remainder or the sclerotium of dense pseudo-parenchyma, small rounded or oval cells, varying in size, somewhat elongated in the central region, with thin and colourless, highly refractive, chitinous walls. Odour, faint; taste, characteristic.

Test for Identity. Shake 1 gramme in a closed flask for about 5 minutes with 20 millilitres of *ether* and about 15 drops of 20 per cent. *of sulphuric acid*. Filter and shake the filtrate with 15 drops of a cold, saturated aqueous solution of *sodium bicarbonate*. The aqueous layer is red or violet.

Test for Purity. When crushed or powdered, it does not develop a rancid or ammoniacal odour upon the addition of hot water.

Assay. *For total alkaloids.* Extract 10 grammes in *moderately fine powder* with *light petroleum* (*boiling-point, 40° to 50°*) in a *continuous extraction apparatus* until the fat is completely removed. Dry the extracted drug at a temperature not exceeding 40° and transfer to a porcelain dish. Add sufficient *anæsthetic ether* to form a semi-liquid mass, then add 8 millilitres of *dilute solution of ammonia* and stir thoroughly with a glass rod. Allow

most of the ether to evaporate, return the residue to the *continuous extraction apparatus* and exhaust with 100 millilitres of *anæsthetic ether*, the extraction being continued for about five hours. Filter the ethereal liquid through a small filter, wash the flask and filter with small quantities of *anæsthetic ether* until a total volume of about 110 millilitres is obtained, and add 20 millilitres of *acetone*. Shake the solution with successive quantities of 20, 10, 10 and 10 millilitres of a 1 per cent. w/v solution of *tartaric acid* in *water*, mix the acid solutions and remove dissolved solvents at room temperature under reduced pressure. Dilute to 50 millilitres with *water*. Mix 1 millilitre with 2 millilitres of *solution of dimethylaminobenzaldehyde*, and allow to stand for five minutes. Mix 1 millilitre of *solution of ergotoxine ethanesulphonate* with 2 millilitres of *solution of dimethylaminobenzaldehyde*, and allow to stand for five minutes. Determine the ratio of the colour intensities by comparing them in a suitable colorimeter. The colour produced by 1 millilitre of solution of *ergotoxine ethanesulphonate* is equivalent to that produced by 0·0001 gramme of total alkaloids calculated as ergotoxine. The acid solution of the alkaloids should be suitably diluted so that the colour produced during the test, does not differ by more than 20 per cent. from that produced in the *solution of ergotoxine ethanesulphonate*. Calculate the percentage of total alkaloids in the drug in terms of ergotoxine.

For water-soluble alkaloids. Transfer 25 millilitres of the acid solution of the alkaloids to a separator and make alkaline with *dilute solution of ammonia*. Shake with successive quantities of 40, 30, 30 and 20 millilitres of *anæsthetic ether*; mix the ethereal liquids and wash by shaking with five successive quantities, each of 40 millilitres, of *water*, made faintly alkaline to *litmus* with *dilute solution of ammonia*, and saturated with *anæsthetic ether*. Shake the washed ethereal solution with successive quantities of 10, 5, 5 and 5 millilitres of a 1 per cent. w/v solution of *tartaric acid* in *water*, mix the acid solutions and remove dissolved ether at room temperature under reduced pressure. Dilute to 25 millilitres with *water* and compare with *solution of ergotoxine ethanesulphonate* as described in the Assay for total alkaloids. Calculate the percentage of water-insoluble alkaloids in the drug in terms of ergotoxine; subtract this figure from the percentage of total alkaloids, previously determined; the difference multiplied by 0·538 gives the percentage of water-soluble alkaloids, calculated as ergometrine.

Storage. Ergot should be thoroughly dried and kept entire, and stored in a cool place. If Ergot is powdered and stored without immediate removal of the fat, the alkaloidal content decreases.

Preparations. Ergota Præparata.
Extractum Ergotæ Liquidum.

When Ergota, Pulvis Ergotæ, or Powdered Ergot is prescribed, Ergota Præparata shall be dispensed.

ERGOTA PRÆPARATA

[Ergot. Præp.]

Prepared Ergot

Prepared Ergot is Ergot which has been powdered and immediately deprived of most of its fat. It contains 0·1 per cent. of total alkaloids of Ergot, calculated as ergotoxine (limits, 0·08 to 0·12) of which not less than 7 per cent. consists of water-soluble alkaloids of Ergot, calculated as ergometrine. In case of higher or lower alkaloidal contents, the strength should be adjusted by the admixture in suitable proportions of Prepared Ergot having a lower or higher alkaloidal content.

Percolate Ergot, recently reduced to a *moderately fine powder*, with *light petroleum* (*boiling point, 40° to 50°*), until 1 millilitre of the percolate leaves not more than a barely perceptible film, when evaporated in a glass basin. Dry the powder by exposure to air, completing the drying, if necessary, in a current of air at a temperature not exceeding 40°. Determine the proportion of total alkaloids in the powder by the Assay described below. To the remainder add, if necessary, in order to produce a Prepared Ergot of the required strength, a sufficient quantity of a powder similarly defatted, prepared from Ergot of lower alkaloidal content but otherwise complying with the requirements described under 'Ergota', or of the powder obtained by drying the marc remaining when Liquid Extract of Ergot has been prepared.

Test for Identity. Shake 1 gramme in a closed flask for about 5 minutes with 20 millilitres of *ether* and about 15 drops of 20 per cent. w/v solution of *sulphuric acid.* Filter and shake the filtrate with 15 drops of a cold, saturated aqueous solution of *sodium bicarbonate.* The aqueous layer is red or violet.

Assay. Weigh accurately 10 grammes, extract with *light petroleum* (*boiling-point, 40° to 50°*) in a *continuous extraction apparatus* until any fat present is completely removed, and complete the Assay as directed under 'Ergota', commencing with the words 'transfer to a porcelain dish............'

Storage. Prepared Ergot should be kept in a well-closed container and stored in a cool, dry place.

DOSES

Metric.	Imperial.
0·3 to 1 gramme.	5 to 15 grains.

Prepared Ergot contains in 1 gramme 0·001 gramme, and in 16 grains 1/60 grain, of the total alkaloids of Ergot, calculated as ergotoxine, and in 1 gramme 0·00014 gramme and in 16 grains 1/500 grains approximately of the water-soluble alkaloids of Ergot, calculated as ergometrine.

EXTRACTUM AYAPANÆ LIQUIDUM

[Ext. Ayap. Liq.]

Liquid Extract of Ayapan

Liquid Extract of Ayapana contains not less than 0·1 per cent. of ayapanin.

Ayapan, in *moderately coarse powder*	1000 grammes.
Alcohol (60 per cent.) . . .	sufficient quantity.

Exhaust Ayapan by percolation with *alcohol* (60 per cent.) and concentrate the percolate to 800 millilitres. Determine the strength

of the extract by the *Assay* described below, and add, if necessary, sufficient Alcohol (60 per cent.), to produce a Liquid Extract of Ayapan of the required strength.

Assay. Evaporate 20 millilitres on a water bath to 1 millilitre. Dilute with 20 millilitres of *water* and proceed as directed under Ayapan beginning with the words "extract thoroughly with *chloroform*.................."

Alcohol content, 50 to 55 per v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 6 mils.	30 to 90 minims.

EXTRACTUM BELÆ FRUCTUS LIQUIDUM

[Ext. Belæ Fruct. Liq.]

Liquid Extract of Bael

Bael, bruised	1000 grammes
Chloroform Water . . .	15000 millilitres.
Alcohol (90 per cent.), sufficient to produce	1000 millilitres.

Macerate the bruised Bael for twelve hours in five thousand millilitres of the Chloroform Water; pour off and reserve the clear liquid; repeat the maceration a second and a third time for one hour in each case, using for each maceration five thousand millilitres of the Chloroform Water and strain the mixed liquids. Evaporate to seven hundred and fifty millilitres; cool; add sufficient Alcohol (90 per cent.) to produce the required volume. Set aside for forty eight hours and filter.

Tests for Purity. *Total solids*, 15 to 20 per cent. w/w.
Alcohol content, 21 to 24 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
4 to 8 mils.	60 to 120 minims.

EXTRACTUM BERBERIDIS

[Ext. Berber.]

Extract of Berberis

Synonym. Rasaut.

Extract of Berberis is a semi-solid watery extract obtained from the roots of *Berberis aristata* D.C., *Berberis coriacea* St., *Berberis asiatica* Roxb., and *Berberis vulgaris* Linn. (Fam. *Berberideæ*) and may be prepared by boiling a suitable quantity of the finely chopped roots with water for 6 hours. At the end of this operation the liquid is

filtered off into an evaporating pan and evaporated to the consistency of a soft extract at a temperature not exceeding 80°.

Extract of Berberis contains not less than 25 per cent. and not more than 35 per cent. of alkaloid determined as berberine sulphate.

Characters. Dark brown or yellow mass; not sticky.

Almost entirely soluble in *water* producing a yellow solution which is bitter, neutral to *solution of litmus* and optically inactive.

Tests for Identity. To a drop of an aqueous solution on a slide, add a drop of *dilute nitric acid.* A cluster of needle shaped crystals appear immediately.

Reduction of an aqueous solution with zinc and *hydrochloric acid* destroys its colour.

Chlorine water added to an aqueous solution produces a red colouration.

Tests for Purity. Loses, on drying at 100°, not more than 10 per cent. of its weight.

Ash, 5 to 10 per cent.

Assay. Extract about 5 grammes in *No. 60 powder,* accurately weighed, in a soxhlet with *dehydrated alcohol* until completely exhausted. To the alcoholic extract add 1 millilitre of *sulphuric acid* previously diluted with an equal volume of water, followed by *ether* in equal volume to the alcoholic extract. Allow the mixture to stand overnight when a precipitate of berberine sulphate separates out. Filter off the precipitate, wash with a mixture of equal volumes of *ether* and *dehydrated alcohol,* dry, and weigh.

Storage. Extract of Berberis should be stored in well closed containers.

DOSES

Metric	Imperial
0·03 to 0·06 gramme.	1/2 to 1 grain.

EXTRACTUM CANNABIS

[Ext. Cannab.]

Extract of Cannabis

Cannabis, in moderately coarse powder	1000 grammes.
Alcohol (95 per cent.)	sufficient quantity.

Exhaust the Cannabis with Alcohol (95 per cent.) by the Percolation Process. Recover the alcohol from the percolate by distillation, and evaporate the residue under reduced pressure at a temperature not exceeding 70°, to a pilular consistence. Mix the mass thoroughly.

Assay. Dissolve 1 gramme in 8 millilitres of *alcohol* (*95 per cent.*) and carry out the assay as directed under Tinctura Cannabis. A dose equivalent to 0·00375 to 0·0075 gramme produces in susceptible animals (this has to be determined by preliminary experiments) an initial excitement, followed by inco-ordination, rocking movements of the head, sluggish corneal reflex, somnolence and sometimes mild narcosis.

Storage. Extract of Cannabis should be stored in dry well-closed containers.

Preparation. Tinctura Cannabis.

DOSES

Metric.	Imperial.
0·015 to 0·06 gramme.	1/4 to 1 grain.

EXTRACTUM EPHEDRÆ LIQUIDUM

[Ext. Ephed. Liq.]

Liquid Extract of Ephedra

Liquid Extract of Ephedra contains 2 per cent. w/v of the total alkaloids of Ephedra, calculated as ephedrine (limits 1·90 to 2·10).

Ephedra, in fine powder . . .	1000 grammes.
Alcohol (90 per cent.) . . .	a sufficient quantity.

Exhaust the drug with Alcohol (90 per cent.) reserving the first 400 millilitres of the percolate. Recover the alcohol from the remainder of the percolate by distillation under reduced pressure at a temperature not exceeding 40° and dissolve the residue in the reserved portion. Determine the proportion of alkaloids in the liquid, thus obtained, by the Assay described below. To the remainder of the liquid add sufficient Alcohol (90 per cent.) to produce a Liquid Extract of Ephedra of the required strength. Set aside for not less than twenty-four hours; filter.

Assay. To 10 millilitres in a separating funnel, add 10 millilitres of *water* and 10 millilitres of *dilute solution of ammonia*: extract with 20 millilitre portions of mixture of 3 volumes of *ether* and 1 volume of *chloroform* until *complete extraction* of the alkaloid is effected. Complete the Assay as under Ephedra beginning with the words "transfer the combined extract to a separating funnel.................."

Preparation. Tinctura Ephedræ.

DOSES

Metric.	**Imperial.**
1·5 to 2 mils.	**20 to 30 minims.**

EXTRACTUM ERGOTÆ LIQUIDUM

[Ext. Ergot. Liq.]

Liquid Extract of Ergot

Liquid Extract of Ergot, when freshly prepared, contains in 100 millilitres, not less than 60 milligrammes of total alkaloids of Ergot, calculated as ergotoxine, and not less than 4·2 milligrammes of water-soluble alkaloids of Ergot, calculated as ergometrine; after storage, it may contain not less than 50 milligrammes of the total alkaloids of Ergot, calculated as ergotoxine and not less than 3·5 milligrammes of water-soluble alkaloids, calculated as ergometrine.

Ergot, in *moderately fine powder*	1000 grammes.
Tartaric Acid Alcohol (50 per cent.)	} of each a sufficient quantity.

Pack the Ergot in a percolator, add sufficient *light petroleum* (*boiling-point, 40° to 50°*) to saturate the drug and to form a layer above it. When the liquid begins to drip from the percolator, close the outlet and macerate for twenty-four hours; then allow percolation to proceed, continuing the addition of *light petroleum* (*boiling-point, 40° to 50°*), until 1 millilitre of the percolate leaves not more than a barely perceptible film when evaporated in a glass basin. Remove the marc from the percolator,

and dry it by exposing it to the air, gradually heating it, if necessary, to a temperature not exceeding 40°. Again reduce it to powder, and moisten it with a sufficient quantity of a 1 per cent. w/v solution of Tartaric Acid in Alcohol (50 per cent.) to render it evenly damp, and allow it to stand for four to six hours in a tightly closed container. Pack the drug in a percolator, add a sufficient quantity of the same menstruum to maintain a layer above the drug. When the liquid begins to drip from the percolator, close the outlet, cover the percolator, macerate for forty-eight hours, then allow percolation to proceed slowly, maintaining a layer of menstruum above the drug. Collect in separate receivers not more than eight portions of percolate, each of 500 millilitres.

Mix together 10 millilitres of each of the portions of percolate, and determine the proportion of total alkaloids by the Assay described below. If the mixture contains more than 0·1 per cent. w/v of total alkaloids, mix together equal volumes of each of the portions of percolate, and dilute the mixture with the menstruum so as to obtain a Liquid Extract of Ergot of the required strength. If the mixture contains less than 0·1 per cent. w/v of total alkaloids, assay separate portions of the percolate, and mix them in the correct proportions to give a Liquid Extract of Ergot of the required strength. If desired, portions of the percolate, containing less than 0·1 per cent. w/v of total alkaloids may be concentrated by evaporating them under reduced pressure at a temperature not exceeding 40°; the concentrated percolate is then added to the unconcentrated portions, if any, and the alkaloidal content of the resulting extract determined, and adjusted, by dilution with alcohol (50 per cent.), to the required strength. Adjust the pH of the Liquid Extract to 3·0 by the addition of suitable quantities of dilute hydrochloric acid.

Assay. Introduce 5 millilitres into a separator, add 50 millilitres of *water*, render slightly alkaline with *dilute solution of ammonia*, and extract with four successive portions of 40, 25, 20 and 15 millilitres of *anæsthetic ether*. Wash the mixed ethereal solutions, with three successive portions of 25 millilitres of *water* mixed with 0·2 millilitres of *dilute solution of ammonia*, then wash once with 25 millilitres of *water*. Complete the Assay as directed under 'Ergota' commencing with the words 'shake with four successive, 10 millilitre portions of a 1 per cent. w/v aqueous solution of *tartaric acid*'.

Alcohol content, not less than 40 per cent. v/v of ethyl alcohol.

Storage. Liquid Extract of Ergot loses activity on keeping. The rate of loss is rapid at ordinary temperatures but slow at 0°. It should be kept in completely filled containers of not more than 2 ounce capacity, and stored in as cool a place as possible. It should be preserved with the addition of Ascorbic Acid (0·5 per cent.).

Labelling. The label should bear the date of manufacture and the date (1 year) after which the product is not intended to be used.

DOSES

Metric.	Imperial.
0·6 to 1·2 mils.	10 to 20 minims.

Liquid Extract of Ergot, when freshly prepared, contains in 1·2 millilitre 0·0007 gramme, and in 20 minims about 1/90 grain, of the total alkaloids of Ergot, calculated as ergotoxine.

EXTRACTUM KALMEGH LIQUIDUM

[Ext. Kalm. Liq.]

Liquid Extract of Kalmegh

Liquid Extract of Kalmegh contains not less than 0·5 per cent. of andrographolide (limits, 0·45 to 0·55).

Kalmegh	500 grammes
Oil of fennel	2 millilitres
Oil of Ajowan	2 millilitres
Alcohol (90 per cent.) . . .	a sufficient quantity

Boil the Kalmegh with 1500 millilitres of water for half an hour and strain. Add further 1500 millilitres of water, boil for half an hour, strain. Repeat the process until a total of 2000 millilitres of the extract are collected. Mix and concentrate to 250 millilitres on the water bath. Dissolve the Oil of Ajowan and Oil of Fennel in 200 millilitres of Alcohol (90 per cent.) and add this alcoholic solution to the concentrated extract. Determine the content of Andrographolide and add enough alcohol to produce a Compound Liquid Extract of Kalmegh of required strength.

Assay. Evaporate about 20 millilitres, accurately measured, on a water bath to about 1 millilitre, add 20 millilitres of *water*, and transfer to a separating funnel. Extract with successive portions of 10 millilitres of *chloroform*. Collect the chloroform extracts and remove the solvent on water bath. Extract the residue *repeatedly* with 10 millilitre portions of *ethyl acetate*. Collect the ethyl acetate extracts, remove the solvent and weigh the residue.

Alcohol contents, 55 to 60 per cent. v/v of ethyl alcohol.

DOSES

Metric.	**Imperial.**
0·5 to 1 mil.	**8 to 15 minims.**

EXTRACTUM KURCHI LIQUIDUM

[Ext. Kurch. Liq.]

Liquid Extract of Kurchi

Liquid Extract of Kurchi contains 1 per cent. w/v of the total alkaloids of Kurchi. (Limits 0·95 to 1·05.)

Kurchi, in fine powder . . .	1000 grammes.
Alcohol (90 per cent.) . . .	a sufficient quantity.

Exhaust the drug by the Percolation Process reserving the first 750 millilitres of percolate. Recover the alcohol from the remainder of the percolate by distillation under reduced pressure at a temperature not exceeding 60° and dissolve the residual extract in the reserved portion. Determine the proportion of alkaloids in the liquid, thus obtained, by the Assay described below. To the remainder of the liquid add

sufficient Alcohol (90 per cent.) to produce a Liquid Extract of Kurchi of the required strength. Set aside for not less than twenty-four hours; filter.

Assay. Introduce 10 millilitres into a separator, add 10 millilitres of *water*, 10 millilitres of *N/2 hydrochloric acid* and 15 millilitres of *chloroform*; shake well and allow to separate. Transfer the chloroform layer to another separator. Repeat extraction with further quantities each of 10 millilitres *chloroform*, until the colouring matter is removed. Wash the mixed chloroform solutions with 10 millilitres of *N/2 hydrochloric acid*, and add the acid solution to the first acid aqueous liquid. Complete the Assay as directed under Kurchi beginning with the words "make very slightly alkaline with *3N sodium hydroxide solution*..................and weigh".

Alcohol content, 75 to 80 per cent. v/v of ethyl alcohol.

DOSES

Metric.	**Imperial.**
12 to 16 mils.	**180 to 240 minims.**

EXTRACTUM MALTI

[Ext. Malt.]

Extract of Malt

Extract of Malt is a product obtained by extracting Malt. The Malt is infused with water at 60°, the expressed liquid concentrated at a temperature not exceeding 60°, preferably under reduced pressure, and the extract mixed with 10 per cent., by weight, of glycerin. It contains dextrin, maltose, a small amount of glucose, amylolytic enzymes and vitamin B_1.

Extract of Malt contains nitrogen equivalent to not less than 4·5 per cent. w/w of protein, and not less than 300 microgrammes of aneurine hydrochloride (Vitamin B_1) per 100 grammes, and is capable of converting not less than its equal weight of starch into water-soluble sugars.

Characters. A sweet, viscous light brown liquid extract having an agreeable, characteristic odour.

Almost completely soluble in cold water, more readily in warm water.

An aqueous solution is not clear and deposits a voluminous, flocculent precipitate on standing.

Tests for Purity. *Specific gravity* (15·5°/15·5°), 1·40 to 1·45; *refractive index* at 28°, 1·4950 to 1·500.

Arsenic Limit. 2 parts per million.

Assay. *For Diastatic Activity.* Mix a quantity of *potato starch*, equivalent to 1 gramme of *dried starch*, in a beaker with 10 millilitres of cold *water*. Add 140 millilitres of boiling *water*, and heat on a water-bath with constant stirring for two minutes, or until a translucent, uniform paste is obtained. Cool to 40° in a suitable bath previously adjusted to this temperature. Add 20 millilitres of a fresh solution of Extract of Malt prepared by dissolving 5 grammes of Extract of Malt in sufficient *water* to make 100 millilitres of solution at 40°. Mix well, and maintain the same temperature for exactly thirty minutes, stirring frequently. A thin, nearly clear liquid is produced. Add at once 0·1 millilitre of this liquid to a previously prepared mixture of 0·2 millilitre of *N/10 iodine* and 60 millilitres of *water*; no blue or reddish colour develops in the mixture.

For nitrogen. Carry out the method for the *determination of total nitrogen.*

For aneurine hydrochloride. Carry out the *method of thiochrome assay for aneurine hydrochloride (Vitamin B_1) or the method of biological assay for Vitamin B_1.*

Storage. Extract of Malt should be stored in well-closed containers and kept in a cool place.

DOSES

Metric.	Imperial.
4 to 16 mils.	60 to 240 minims.

EXTRACTUM MALTI CUM OLEO SELACHOIDEI

[Ext. Malt. c. Ol. Selachoid.]

Extract of Malt with Shark-Liver Oil

Extract of Malt with Shark-Liver Oil contains approximately 5 per cent. w/w of Shark-Liver Oil and not less than 200 International Units of vitamin A per gramme.

Extract of Malt	950 grammes.
Shark-Liver Oil	50 grammes.

Mix thoroughly with the aid of gentle heat, if necessary.

Characters. Thick, viscous, amber coloured liquid. Odour, characteristic, not rancid; taste, agreeable.

Test for Purity. *Specific gravity* (25°/25°), 1·40; *refractive index* at 25°, 1·4900.

Assay. Weigh accurately about 20 grammes in a beaker and mix thoroughly with *water* (3 millilitres for every gramme taken). Add a quantity of alcohol in the ratio of 8 parts of *dehydrated alcohol* to 5 parts of the above dilution, and 0·8 gramme of kaolin. Stir thoroughly and allow the precipitate to settle. Filter the clear liquid and add to the precipitate about 50 millilitres of *alcohol (70 per cent.)*, again stirring and allowing to settle. Filter the clear liquid through ordinary grade filter paper using a rapid filtering funnel and collect the residue on the filter, washing out the beaker with *alcohol (70 per cent.)*. When the precipitate has drained, release any liquid from the stem of the funnel and wash the residue with *ether* from a wash bottle, collecting the ether in a separating funnel. Any precipitate adhering to the paper should be separated with a rounded glass rod. Continue washing with *ether* until a drop shows no film of oil on evaporation, about 300 to 350 millilitres being necessary. Wash the ether in the separating funnel with three portions of 30 millilitres of *water*. Evaporate, add a few millilitres of *dehydrated alcohol*, and re-evaporate with usual precautions so that the vitamin A is not destroyed. The vitamin A activity of the oil so obtained is determined by the *spectrophotometric or the tintometric method for the determination of vitamin A.*

Storage. Extract of Malt with Shark-Liver Oil should be stored in air-tight containers and kept in a cool place.

DOSES

Metric.	Imperial.
4 to 16 mils.	60 to 240 minims.

NOTE. *Bottles containing Extract of Malt with Shark-Liver Oil should be used up as quickly as possible after it is opened (preferably within a fortnight) and should be carefully corked every time it is opened.*

EXTRACTUM PERPOLITIONUM ORYZÆ

[Ext. Perpol. Oryz.]

Extract of Rice Polishings

Synonym. Extract of Rice Bran.

Extract of Rice Polishings contains, in each millilitre, not less than 60 micro-grammes of aneurine hydrochloride, vitamin B_1 ($C_{12}H_{17}ClN_4O_5S.\ HCl,H_2O$), obtained in the following way :—

Mix 1000 grammes of Rice Polishings with 3000 millilitres of a mixture of 3 volumes of Alcohol (95 per cent.) and 1 volume of Distilled Water and macerate the mixture with occasional stirring during at least 48 hours. Separate the supernatant liquid, and remove as much liquid from the residue as possible by pressure. Filter the liquid, and evaporate under reduced pressure at a temperature not exceeding 60° to a specific gravity of approximately 1·22. Mix this residue with an equal volume of Alcohol (95 per cent.) and allow to stand for 24 hours. Decant the supernatant liquid, and reject the gummy residue. Filter the liquid, and evaporate under reduced pressure at a temperature not exceeding 60° to an extract having a specific gravity of approximately 1·32. Heat the extract to 65° and transfer at once to suitable containers, seal and then heat for 30 minutes at 65°. One millilitre is approximately equivalent to 14·5 grammes of Rice Polishings.

Characters. A dark brown, viscous liquid; *specific gravity (25°/25°)* 1·30. Odour, that of burnt sugar; taste, sweet.

Miscible with cold *water*, but more readily so with warm *water*.

Assay. *For Vitamin B_1.* Carry out the *method of thiochrome Assay for aneurine hydrochloride.*

Storage. Extract of Rice Polishings should be stored in well-closed containers.

DOSES

Metric.	Imperial.
15 to 30 mils.	1/2 to 1 fluid ounce.

NOTE. *Benzoic acid, in an amount not exceeding 0·2 per cent. may be added to this extract as a preservative.*

EXTRACTUM PICRORHIZÆ LIQUIDUM

[Ext. Picrorh. Liq.]

Liquid Extract of Picrorhiza

Picrorhiza, in No. 60 powder . . 1000 grammes.

Alcohol (60 per cent.), sufficient to produce . . . . . 1000 millilitres.

Exhaust the Picrorhiza with Alcohol (60 per cent.) by the Percolation Process, reserve the first 800 millilitres of the percolate and

recover the alcohol from the remainder by distillation. Evaporate the residue to a soft extract and dissolve this in the reserved portion. Add sufficient Alcohol (60 per cent.) to produce the required volume.

Alcohol content, 50 to 55 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
1 to 4 mils.	15 to 60 minims.

EXTRACTUM PUNARNAVÆ LIQUIDUM

[Ext. Punar. Liq.]

Liquid Extract of Punarnaba

Punarnaba, in *coarse powder* . .	2000 grammes.
Alcohol (60 per cent.) . . .	sufficient quantity of each.
Distilled Water . . .	

Exhaust the drug by the Percolation Process with Alcohol (60 per cent.) reserving the first 700 millilitres of the percolate. Recover the alcohol from the remainder of the percolate by distillation and dissolve the residue in the reserved portion. Add sufficient Distilled Water to make the volume up to 1000 millilitres. Clarify by subsidence or by filtration.

Alcohol content, 40 to 45 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 8 mils.	30 to 120 minims.

EXTRACTUM RAUWOLFIÆ LIQUIDUM

[Ext. Rauwol. Liq.]

Liquid Extract of Rauwolfia

Liquid Extract of Rauwolfia contains 1·0 per cent. w/v of the total alkaloids of Rauwolfia (limits 0·95 to 1·05).

Rauwolfia, in *moderately coarse powder*	1000 grammes.
Alcohol (90 per cent.)	a sufficient quantity.

Exhaust the drug by Percolation with Alcohol (90 per cent.) reserving the first 800 millilitres of the percolate. Remove the alcohol from the remainder of the percolate by distillation and evaporate the residue to a soft extract at a temperature not exceeding 60° ; dissolve this in the reserved portion. Determine the proportion of alkaloid in the liquid thus obtained by the Assay described below. To the remainder of the

liquid add sufficient Alcohol (90 per cent.) to produce a Liquid Extract of Rauwolfia of the required strength. Set aside for not less than 24 hours ; filter if necessary.

Assay. Introduce 10 millilitres into a separator, add 10 millilitres of *water*, 10 millilitres of *N/2 hydrochloric acid* and 15 millilitres of *chloroform*. Shake well and allow to separate. Transfer the chloroform layer to another separator. Repeat extraction with further quantities, each of 10 millilitres of *chloroform*, until the colouring matter is removed. Wash the mixed chloroform solution with 10 millilitres of *N/2 hydrochloric acid*, and add the acid solution to the first acid aqueous liquid. Complete the Assay as directed under Rauwolfia beginning with the words "make the total acid solution alkaline to solution of litmus with *dilute solution of ammonia*..................as total alkaloids".

Alcohol content, 85 to 90 per cent. v/v of ethyl alcohol.

Preparation. Tinctura Rauwolfiæ.

DOSES

Metric.	**Imperial.**
0·2 to 0·5 mil.	**3 to 6 minims.**

EXTRACTUM RAUWOLFIÆ SICCUM

[Ext. Rauwol. Sicc.]

Dry Extract of Rauwolfia

Dry Extract of Rauwolfia contains 4·0 per cent. of the total alkaloids of Rauwolfia (limits 3·8 to 4·2).

Rauwolfia, in *moderately coarse powder* 1000 grammes.

Alcohol (90 per cent.) . . . a sufficient quantity.

Pack the Rauwolfia in a percolator and add sufficient Alcohol (90 per cent.) to saturate the drug and form a layer above it. When the liquid begins to drip from the percolator, close the outlet and macerate for 16 hours ; then allow percolation to proceed until the drug is exhausted. Evaporate the percolate to a soft extract under reduced pressure at a temperature not exceeding 70°, add 50 grammes of dried *starch* and continue the evaporation at the same temperature until the product is dry. Powder the residue. Assay the powdered residue and add sufficient starch, dried at 100°, to make the finished extract contain in each 100 grammes, 4·0 grammes of the total alkaloids of Rauwolfia. Mix thoroughly and pass the extract through a *No. 22 sieve*.

Assay. Weigh accurately, about 2 grammes, into a 500 millilitre stoppered flask and complete the assay as directed under Rauwolfia beginning with the words "and add 200 millilitres of a mixture of ....as total alkaloids".

DOSES

Metric.	**Imperial.**
0·03 to 0·06 gramme.	**½ to 1 grain.**

EXTRACTUM SACCHAROMYCES SICCUM CONCENTRATUM

[Ext. Saccharomy. Sicc. Conc.]

Concentrated Extract of Dried Yeast

Concentrated Extract of Dried Yeast is obtained by concentrating in *vacuo* an aqueous or 0·01 per cent. acetic acid extract of Dried Yeast or an autolysed extract of Dried Yeast, to a pasty consistency.

Concentrated Extract of Yeast contains, in each gramme, the equivalent of not less than 15 micro-grammes of aneurine hydrochloride ($C_{12}H_{17}ON_4SCl.HCl$), 60 micro-grammes of riboflavin ($C_{17}H_{20}O_6N_4$), and 300 micro-grammes of nicotinic acid ($C_6H_5O_2N$). It contains about 65 per cent. of solids, 35 per cent. of moisture, and 2·7 per cent. of mineral matter.

Characters. A dark brown, viscous liquid of thick syrupy consistency; odour, meaty and characteristic; taste, saline.

Almost completely soluble in water.

Tests for Purity. Concentrated Extract of Yeast is slightly acid to *solution of litmus.*

Ignite to constant weight a shallow nickel basin containing about 10 grammes of clean dry sand. Weigh accurately about 2 or 3 grammes of the thoroughly mixed sample and dissolve in hot *water*, carefully wash this solution into the nickel basin and mix intimately with the sand, using a glass rod. Dry the basin on a water bath and complete the drying by keeping in an oven for 20 hours at 100°. Cool in a desiccator and weigh. The gain in weight represents the total solids in the sample and loss in weight in the sample taken represents the moisture content (limit of total solids and moisture content).

Dissolve 2 grammes of the sample in 10 millilitres of *water*. Add 1 millilitre of *hydrochloric acid*. Concentrate to 5 millilitres on a water bath and continue heating for another 1½ hours under an air condenser. Cool the flask to 18° and add 20 millilitres of a saturated solution of *trinitrophenol* and mix. Add 10 millilitres of a 10 per cent. w/v solution of *sodium hydroxide* and allow to stand for exactly five minutes. Wash the contents of the flask into a 500 millilitre flask and make up to 500 millilitres with *water*. Filter the solution. No yellow or orange colour is produced (absence of creatine and creatinine).

Weigh accurately 3 to 5 grammes after thorough mixing in a dry ignited tared crucible (preferably of platinum). Incinerate at a low heat until completely carbonised and then at dull red heat over a naked Bunsen Flame or in an electric muffle furnace until a light grey or whitish ash is produced and to constant weight. Cool in a desiccator and weigh after room temperature is reached. If any black carbon particles are seen ashing may be hastened by adding a few drops of *nitric acid* and gently igniting. The gain in weight represents the mineral matter present in the sample (limit of mineral matter).

Assay. *For protein.* Carry out the *method for estimation of total nitrogen.*

For aneurine hydrochloride. Carry out the *method of thiochrome assay for aneurine hydrochloride* or the *method of biological assay for vitamin B_1.*

For riboflavin. Carry out the *microbiological assay of riboflavin.*

For nicotinic acid. Carry out the *chemical method of estimation of nicotinic acid* or the *microbiological Assay for nicotinamide.*

Storage. Concentrated Extract of Dried Yeast should be stored in well-closed coloured glass containers and protected from light.

EXTRACTUM VASAKÆ LIQUIDUM

[Ext. Vasak. Liq.]

Liquid Extract of Vasaka

Vasaka, *in No. 40 powder* . . . 2000 grammes.
Alcohol (60 per cent.) . . . a sufficient quantity.

Exhaust the drug by the Percolation Process reserving the first 800 millilitres of the percolate. Recover the alcohol from the remainder of the percolate by distillation, and evaporate the residue to the consistence of a soft extract. Dissolve this in the reserved portion, and add enough Alcohol (60 per cent.) to produce 1000 millilitres.

Alcohol content, 55 to 60 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
1 to 2 mils.	15 to 30 minims.

GELATINUM

[Gelat.]

Gelatin

Gelatin is a product obtained by the partial hydrolysis of collagen, derived from the skin, white connective tissue, and bones of animals and fish. When derived from an acid-treated precursor, it exhibits an isoelectric point between pH 7 and pH 9; when derived from an alkali treated precursor it has an isoelectric point between pH 4·7 and pH 5·0.

Characters. White or pale yellowish, translucent sheets, flakes, shreds, or a coarse or fine powder. Odour and taste, very slight, characteristic. Stable in air when dry but is subject to microbic decomposition when moist or in solution.

Insoluble in cold *water*, but swells and softens when immersed in it, gradually absorbing from five to ten times its own weight of water; soluble in hot *water*; insoluble in *alcohol* (*90 per cent.*), in *ether*, and in *chloroform*; soluble in a hot mixture of glycerin and *water*, and in *acetic acid*.

Tests for Identity. Dilute aqueous solution yields a precipitate with *solution of trinitrophenol*, and with *solution of tannic acid*, but not with other acids, and not with a dilute *solution of alum*, *solution of lead acetate*, or test *solution of ferric chloride*.

Tests for Purity. A 2 per cent. w/v solution in hot *water* is odourless, and on cooling, forms a transparent or translucent jelly.

Leaves, on incineration, not more than 2 per cent. of residue.

Heat 15 grammes with 60 millilitres of a 25 per cent. w/v solution of *hydrochloric acid As T.* in a covered flask until all insoluble matter is flocculated and the Gelatin dissolved. Add an excess (about 15 millilitres) of *solution of bromine*, neutralise with *dilute solution of ammonia*, add 1·5 grammes of *sodium phosphate*, and allow to cool. Add a slight excess, about 30 milli-

litres of *magnesia mixture*, allow to stand for 1 hour, filter, and wash with five 10 millilitre portions of *dilute solution of ammonia* diluted with 3 volumes of *water*. Drain the precipitate well, and dissolve it in a 25 per cent. w/v solution of *hydrochloric acid As T* to a volume of exactly 50 millilitres. Subject 5 millilitres of this solution to the test for arsenic. The stain, if any, is not more intense than that produced in a test made with similar quantities of the same reagents and 0·15 millilitres of the *dilute solution of arsenic As T*. (limit of arsenic).

Incinerate 1 gramme of Gelatin without the use of sulphuric acid. To the residue add 2 millilitres of *hydrochloric acid* and 0·5 millilitre of *nitric acid*, and evaporate the mixture to dryness on a steam bath. Add to the residue 1 millilitre of *N/1 hydrochloric acid* and 15 millilitre of *water*, and warm for a few minutes. Filter, and wash with sufficient *water* to make the filtrate measure 50 millilitres. To 25 millilitres of the filtrate, add 10 millilitres of *solution of hydrogen sulphide*. Carry out the *test for heavy metals*, the limit of which for Gelatin is 50 parts per million (limit of heavy metals).

Dissolve 20 grammes in 50 millilitres of hot *water* in a flask having a round bottom and a long neck, add 5 millilitres of *phosphoric acid* and 1 gramme of *sodium bicarbonate*, and at once connect the flask with a condenser. Distil 50 millilitres receiving the distillate under the surface of 50 millilitres of *N/10 iodine*. Acidulate the distillate with a few drops of *hydrochloric acid*, add 2 millilitres of *solution of barium chloride* and heat on a water bath until the liquid is nearly colourless. The precipitate of barium sulphate, if any, when filtered, washed, and ignited, weighs not more than 3 milligrammes corresponding to not more than 0·004 per cent. of *sulphur dioxide*, correction being made for any sulphate which may be present in 50 millilitres of *N/10 iodine* (limit of sulphur dioxide).

Place 1 gramme accurately weighed, and 99 millilitres of *water* in a 200 millilitre flask, allow to stand for 15 minutes then place the flask in a water bath at 60°, and swirl occasionally until solution is complete. Transfer 10 millilitres of the solution to a test tube having an internal diameter of 12 millimeters and place the tube in an ice-bath, making certain that the top of the solution is below the level of the ice and water. Place the bath containing the tube in a refrigerator, and maintain it at about 0° for 6 hours. When the tube is removed from the bath and inverted, no movement of the gel observed (strength of gel).

When examined as directed under *Bacteriological Examination of Gelatin*, the total bacterial count in Gelatin should not exceed 10,000 per gramme, and *Escherichia coli* must not be present in 10 milligrammes or less (limit of bacterial count).

Storage. Gelatin should be stored in well-closed containers in a dry place.

GELATUM ALUMINI HYDROXIDI

[**Gel. Alum. Hydrox.**]

Aluminium Hydroxide Gel

Colloidal Aluminium Hydroxide is an aqueous suspension containing the equivalent of not less than 3·6 per cent. and not more than 4·4 per cent. of Al_2O_3, chiefly in the form of the hydrous oxide of aluminium.

Characters. White viscous suspension, translucent in thin layers from which small amounts of water may separate on standing.

Affects slightly both *red* and *blue litmus paper* but does not affect a *solution of phenolphathalein*.

Tests for Identity. A solution in *hydrochloric acid* yields the reactions for aluminium.

Tests for Purity. Transfer about 1·5 millilitres of the well-shaken material to a tared 125 millilitres glass-stoppered flask and weigh. Add 50 millilitres of *N/10 hydrochloric acid* and adjust the temperature of a mixture to 37·5°. Tightly stopper the flask and maintain at this temperature for 1 hour. Add 5 drops of *solution of bromophenol blue,* and titrate the excess acid with *N/10 sodium hydroxide.* Calculate the number of millilitres of *N/10 hydrochloric acid* required to neutralise 1 gramme of the material taken for test. The volume of *N/10 hydrochloric acid* consumed is not less than 12·50 millilitres and not more than 25·0 millilitres for each gramme of material taken for test (limits of acid absorbing capacity).

Transfer 10 millilitres to a porcelain dish. Add 0·1 millilitre of *N/1 potassium chromate* and 25 millilitres of *water.* Stir and add *N/10 silver nitrate* until a faint persistent pink colour is obtained. Not more than 8 millilitres are required (limit of chloride).

Dissolve 5 millilitres in 5 millilitres of *dilute hydrochloric acid* with the aid of heat. Cool and dilute to 250 millilitres with *water.* Mix well and filter if necessary. A 20 millilitre portion of the filtrate shows no more sulphate than corresponds to 0·2 millilitre of *N/50 sulphuric acid* (limit of sulphate).

To 5 millilitres add 10 millilitres of *dilute sulphuric acid,* heat to boiling, then cool. One-half of this solution representing 2·5 millilitres of the material taken for test, meets the requirements of the test for arsenic (limit of arsenic).

Dissolve 5 millilitres in 10 millilitres of *dilute hydrochloric acid* with the aid of heat and filter if necessary. Dilute to 25 millilitres with *water* and carry out the *test for heavy metals,* the limit of which is 5 parts per million (limit of heavy metals).

Assay. To about 5 grammes accurately weighed, add 10 millilitres of *hydrochloric acid* and 100 millilitres of *water,* Heat to boiling, filter if necessary and add 100 millilitres of *water,* 5 drops of *solution of methyl red,* and sufficient *dilute solution of ammonia* to produce a distinct yellow colour in the mixture. Heat to boiling and filter. Wash the precipitate with hot *water* made slightly alkaline with *dilute solution of ammonia* until the precipitate is free from chloride. Dry and ignite to constant weight.

Storage. Colloidal Aluminium Hydroxide should be stored in well-closed containers.

DOSES

Metric.	Imperial.
4 to 8 mils.	60 to 120 minims.

NOTE. *Sufficient oil of peppermint, glycerin, sucrose, or saccharin may be added for flavouring and other purposes. Sodium benzoate in an amount not exceeding 0·5 per cent. may be added as a preservative.*

GLYCERINUM PAPAINI

[Glycer. Papain.]

Glycerin of Papain

Papain	110 grammes.
Dilute Hydrochloric acid . .	80 millilitres.
Simple Elixir	50 millilitres.
Glycerin, sufficient to produce .	1000 millilitres.

Digest the Papain for seven days in a mixture of Dilute Hydrochloric Acid and 700 millilitres of Glycerin, filter, at pH 5·6 to 5·8, add the Simple Elixir, and sufficient Glycerin to produce the required volume.

The amino acids produced by 5 millilitres of Glycerin of Papain require for neutralisation not less than 10 millilitres of N/10 sodium hydroxide.

Assay. Prepare a 4 per cent. w/v solution of gelatin and adjust the pH of this solution to 5·0 by the addition of a few millilitres of *N/10 sodium hydroxide.* To 50 millilitres of this solution add 10 millilitres of *citrate buffer* of pH 5·0. 5 millilitres of the sample is made up to 10 millilitres with *water* after adjusting the pH to 5·0. 10 millilitres of this solution are added to the *gelatin* buffer solution. Withdraw immediately 25 millilitres from this mixture and add 20 millilitres of *formaldehyde solution* freshly neutralised to phenolphthalein with *N/10 sodium hydroxide.* Titrate with *N/10 sodium hydroxide* using *phenolphthalein* as indicator. Incubate the remainder of the mixture at a temperature of 37° for a period of 3 hours. Withdraw 25 millilitres of the mixture and add 20 millilitres of *formaldehyde solution* previously neutralised to phenolphthalein. Titrate with *N/10 sodium hydroxide* to the same end point as in the previous titration.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

GOSSYPIUM PURIFICATUM

[Gossyp. Puri.]

Purified Cotton

Synonym. Absorbent Cotton.

Absorbent Cotton consists of the hairs of the seed of cultivated varieties of *Gossypium herbaceum* Linn. or other species of *Gossypium* (Fam. *Malvaceæ*), freed from adhering impurities, deprived of fatty matter, bleached, and sterilised.

Characters. White, soft, fine, filament-like hairs; microscopically, hollow, flattened; twisted bands, striate and slightly thickened at the edges. Odourless; tasteless.

Insoluble in ordinary solvents; soluble in *ammoniacal solution of cupric oxide.*

Tests for Purity. Weigh about 5 grammes accurately in a porcelain or platinum dish and moisten with *dilute sulphuric acid.* Heat gently until charred, then ignite more strongly until the carbon is completely consumed. Cool and weigh. The weight of ash does not exceed 0·5 per cent. of the weight of material taken for test (limit of ash).

Saturate about 10 grammes with 100 millilitres of recently boiled and cooled *water,* then press out two 25 millilitre portions of *water* into white porcelain dishes. Add 3 drops of *solution of phenolphthalein* to one portion and 1 drop of *solution of methyl orange* to another. No pink colour develops in either (limit of acid and alkali).

Pack 10 grammes, ± 10 milligrammes, in a Soxhlet extractor and extract with ether for 5 hours into a tared flask. The ether solution shows no trace of blue green or brownish colour. Evaporate the extract to dryness, and dry for 1 hour at 105°. The weight of the residue does not exceed 0·07 gramme (limit of fatty material).

Boil 10 grammes in a beaker with 1000 millilitres of *water* for 30 minutes adding *water* to maintain the volume. Pour the *water* into another vessel through a funnel and press out the excess water from the cotton with a flattened glass rod. Wash the cotton in the funnel with two 250 millilitre portions of boiling *water* pressing the cotton after each washing. Filter the combined extract and washings and wash the filter thoroughly with hot *water*. Evaporate the filtrate to a small volume, transfer to a tared porcelain or platinum dish, evaporate to dryness and dry the residue to constant weight at 105°. The weight does not exceed 0·25 per cent. of the material taken for test (limit of water soluble substances).

The fibre length determined by the *method for determination of fibre length* is not less than 1·86 centimetres.

The absorbency time determined by the *method for determination of absorbency* is not more than 10 seconds.

Sterility. Absorbent cotton is sterilised by heating in vacuo at 120° for not less than 30 minutes, and should meet the *Sterility Tests for Solids*.

HYOSCYAMUS

[Hyoscy.]

Hyoscyamus

Indian names. Baluchi—*Koheebhang ;* Bengali—*Khorasani ajowan ;* Hindi—*Khurasani-ajvayan ;* Sanskrit—*Parasikaya ;* Tamil—*Kurasaniyomam.*

Hyoscyamus consists of the dried leaves and flowering tops of *Hyoscymus muticus* Linn. (Fam. *Solanaceæ*) collected soon after the plant has flowered. It contains not more than 2 per cent. of other organic matter, not more than 25 per cent. of its stem, none of which is more than 7 millimetres in thickness, and not less than 0·05 per cent. of the alkaloids of Hyoscyamus calculated as hyoscyamine.

Hyoscyamus is adjusted, if necessary, by the admixture in suitable proportion of Hyoscyamus having a higher or lower alkaloidal content, to contain 0·05 per cent. of the total alkaloids, calculated as hyoscyamine.

Characters. Leaves, greenish-brown, cauline, scattered, ovate-oblong, acute ; thick, coarsely sinuate-dentate, pubescent, base acute ; petioles, broad, 1·3 to 7 centimetres long. Lower leaves much larger than the upper ones. The laminæ attain a length of about 12·5 centimetres. Stomata, of solanaceous type on both surfaces ; hairs, uniseriate, often branched, up to 300 microns in length, non-glandular ; crystals of calcium oxalate prisms in the mesophyll. Branches, pubescent, thickly covered with soft clammy wooly hairs ; inflorescence, a spicate raceme containing 10 to 30 flowers. Corolla, tube greenish, limbs pink, ribbed, funnel shaped, 2·5 to 3·8 centimetres in length. Pyxis, cylindrical. Odour, characteristic ; taste, bitter and slightly acrid.

Tests for Purity. *Ash,* not more than 20 per cent. ; *Acid-insoluble ash,* not more than 12 per cent.

Assay. Weigh accurately about 4 grammes in *No. 60 powder,* transfer to a flask, and add 200 millilitres of a mixture of 4 volume of *ether* and 1 volume of *alcohol* (*95 per cent.*). Shake well, set aside for ten minutes, add 6 millilitres of *dilute solution of ammonia,* and shake frequently during one hour. Transfer the mixture to a percolator plugged with cotton wool, and when

the liquid ceases to flow, pack firmly and continue the percolation, first with 100 millilitres of a similar mixture of *ether* and *alcohol* (*95 per cent.*), and then with *ether*, until *complete extraction* of the alkaloids is effected. The total time of percolation should not exceed two hours. To the percolate add 30 millilitres of *N/2 hydrochloric acid*, shake well, allow to separate, and run off the lower layer. Continue the extraction, using 15 millilitres of a mixture of 4 volumes of *N/10 hydrochloric acid* and 1 volume of *alcohol* (*95 per cent.*), and repeat the process, until *complete extraction* of the alkaloids is effected. Transfer to a separator with 20 millilitres of *N/10 hydrochloric acid* and 20 millilitres of *chloroform*. Shake, allow to separate, and run the chloroform solution into a second separator, containing 20 millilitres of *N/10 hydrochloric acid*, shake this, allow to separate, and reject the chloroform. Continue the extraction of the liquid in the first separator with two further quantities of 10 millilitres each of *chloroform*, transferring the chloroform solution each time to the second separator, washing it with the same aqueous acid liquid as before, and rejecting it. Transfer the acid washings from the second separator to the first separator, add excess of *dilute solution of ammonia*, and without delay shake with successive quantities of about 25 millilitres of *chloroform*, until *complete extraction* of the alkaloids is effected carrying out the extraction as rapidly as possible, and wash each chloroform solution with the same 20 millilitres of *water* contained in another separator. Evaporate the chloroform, add to the residue 3 millilitres of *alcohol* (*95 per cent.*), evaporate, and dry at 80° for two hours. Dissolve the residue in 10 millilitres of *N/50 sulphuric acid*, and titrate with *N/50 sodium hydroxide* using *solution of methyl red*, as indicator. Each millilitre of *N/50 sulphuric acid* is equivalent to 0·005784 gramme of alkaloids, calculated as hyoscyamine.

Storage. Hyoscyamus should be stored in a dry place.

Preparations. Extractum Hyoscyami Liquidum.
Extractum Hyoscyami Siccum.
Tinctura Hyoscyami.

DOSES

Metric.	Imperial.
0·2 to 0·4 gramme.	**3 to 6 grains.**

INFUSUM CHIRATÆ COMPOSITUM CONCENTRATUM

[Inf. Chirat. Co. Conc.]

Concentrated Compound Infusion of Chirata

Chirata, cut small	100 grammes.
Dried, Sweet-Orange Peel, thinly sliced	100 grammes.
Lemon Peel, thinly sliced	200 grammes.
Alcohol (25 per cent.)	1,200 millilitres.

Macerate, in a covered vessel for forty-eight hours, the Chirata, Dried Sweet-Orange Peel, and Lemon Peel with 800 millilitres of the Alcohol (25 per cent.); press out the liquid. To the pressed marc, add 400 millilitres of the Alcohol (25 per cent.); macerate for twenty-four hours; press; add the liquid to the product of the first pressing. Set aside for not less than fourteen days; filter.

Alcohol content, 20 to 24 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	**30 to 60 minims.**

INJECTIO ADRENALINÆ HYDROCHLORIDI

[Inj. Adrenal. Hydrochlor.]

Injection of Adrenaline Hydrochloride

CAUTION. *In any part of India in which Injectio Adrenaline Hydrochloridi is controlled by law, care must be taken that the provisions of such law are duly complied with (see page ix).*

Synonyms. Injectio Adrenalini Hydrochloricus : Hydrochloric Solution of Adrenaline for Injection : Epinephrine Hydrochloride Injection.

Injection of Adrenaline Hydrochloride is a sterile solution of Adrenaline in Hydrochloric Acid and *Water for Injection* containing in each 100 millilitres not less than 0·090 gramme and not more than 0·110 gramme of $C_9H_{13}O_3N$. It may be prepared as follows :—

Adrenaline	1 gramme.
Dilute Hydrochloric Acid . . .	3 millilitres.
Potassium Metabisulphite . . .	1 gramme.
Water for Injection, sufficient to produce .	1,000 millilitres.

Dissolve the Chlorobutol or Chlorocresol in 900 millilitres of boiling *Water for Injection*, cool, add the Dilute Hydrochloric Acid, dissolve the Adrenaline in the mixture and add sufficient *Water for Injection*, to produce the required volume. Determine the hydrogen-ion concentration of the solution and adjust it to about 2·5. Distribute in 1 millilitre ampoules and sterilise by heating at 80° for one hour.

The containers used comply with the tests for *limit of alkalinity of glass.*

Injection of Adrenaline Hydrochloride possesses the characters of and responds to the tests described under Liquor Adrenalinæ Hydrochloridi.

Assay. A suitable solution of Adreneline Hydrochloride injected intravenously into a cat or dog by the prescribed '*pressor assay method in spinal animals*' produces a rise in the systolic blood pressure of the animal corresponding to that produced by an equal amount of a solution of standard chemically pure Adrenaline.

NOTE. *Evidence of potency within 10 per cent. below and 10 per cent. above is acceptable.*

Storage. Injection of Adrenaline Hydrochloride shall be kept in 1 millilitre ampoules of resistant glass protected from light. The label of the container shall indicate the strength of the solution (1 in 1,000), the date of manufacture, and the date up to which it is expected to remain its potency which should not exceed 12 months after date of manufacture.

DOSES

By subcutaneous injection.

Metric.	Imperial.
0·12 to 0·5 mil.	2 to 8 minims.

INJECTIO DEXTROSI

[Inj. Dextros.]

Injection of Dextrose

CAUTION. *In any part of India in which Injectio Dextrosi is controlled by law, care must be taken that the provisions of such law are duly complied with.* (*See page ix.*)

Injection of Dextrose is a sterile solution of Dextrose in *Water for Injection*. It contains not less than 95 per cent. and not more than 105 per cent. of the specified amount of Dextrose Monohydrate ($C_6H_{12}O_6.H_2O$).

Characters. A perfectly colourless solution.

Tests for Identity. Add a few drops to 5 millilitres of hot *alkaline solution of cupric tartrate*. A copious red precipitate of cuprous oxide is produced.

Tests for Purity. Evaporate a volume of Injection of Dextrose, equivalent to 3 grammes of dextrose, in a porcelain dish or crucible, to dryness on a steam bath, then thoroughly char the residue. Cool, add a mixture of *dilute hydrochloric acid* and 3 millilitres of *solution of bromine*, cover the dish, and boil gently for 10 minutes. Filter, and wash the filter and residue with 25 millilitres of hot *water*. Evaporate the filtrate to a volume of about 15 millilitres, cool, and add *dilute solution of ammonia*, dropwise, until the solution is neutral to *red or blue litmus paper*, then add 2 millilitres of *dilute acetic acid*, dilute to 25 millilitres with *water*, and add 10 millilitres of *solution of hydrogen sulphide*. The resulting colour, if any, is not darker than that of a control made in the same manner with the same quantities of the reagents and to which 1·5 millilitres of *standard lead solution* has been added, the solutions being compared in matched Nessler tubes (limit of heavy metals).

Injection of Dextrose diluted, if necessary, with *Water for Injection* to contain 5 per cent. of dextrose, complies with the *Pyrogen Test*.

Complies with the *sterility test for liquids*.

Assay. Transfer an accurately measured volume of Injection of Dextrose containing 2 to 5 grammes of dextrose, to a 100 millilitre flask. Add a few drops of *dilute solution of ammonia*, dilute with *water* to exactly, 100 millilitres, and mix well. After 30 minutes determine the angular rotation in 200 millimetre tube at 25°. The observed rotation in degrees multiplied by 1·0425, represents the weight of dextrose mono-hydrate ($C_6H_{12}O_6.H_2O$) in 100 millilitres of the dilution.

Storage. Injection of Dextrose should be kept in sealed ampoule of neutral resistant glass, preferably in single doses.

NOTE. *Bacteriostatic agents must not be added. If the ampoules show any colour or contains a precipitate or any suspended impurity it must be rejected.*

INJECTIO PROTEINI HYDROLYSATI

[Inj. Protein. Hydrolys.]

Injection of Protein Hydrolysate

CAUTION. *In any part of India in which Injectio Proteinae Hydrolysatum is controlled by law, care must be taken that the provisions of such law are duly complied with.* (*See page ix.*)

Synonym. Peptone Glucose Solution.

Injection of Protein Hydrolysate is a mixture of the products of hydrolysis of a biologically complete protein and consists essentially of amino-acids with added glucose and sodium chloride.

It contains 5 per cent. Glucose, 0·9 per cent. sodium chloride, not less than 0·75 per cent. and not more than 0·80 per cent. of total nitrogen, and may be obtained in the following way :—

Mince fresh clean meat (obtained from domesticated animals used as food by man), in a suitable container provided with a lid. Mix with a suitable quantity of Papain, previously determined, and Distilled Water. Cover with a layer of toluene to prevent bacterial action, and heat the mixture to a temperature of 50° to 55° for 48 hours or more at the end of which filter through cheese cloth and finally through lint. Mix the filtrate with *Water for Injection* and adjust the pH to about 7·4 by the addition of a solution of Sodium Hydroxide in *Water for Injection* and autoclave at 10 lbs. pressure for not less than 30 minutes to remove metaproteins and albumoses. Filter the liquid and autoclave a small portion again. No further precipitation should occur. Assay a portion of the clear filtrate for its nitrogen content, and incorporate chemically pure glucose and sodium chloride in the required amount in the solution, adjust the volume finally with *Water for Injection*. Filter the solution again; it should appear clear in a Nephelometer. Finally distribute in screw-capped neutral galss bottles (previously sterilised and washed with *Water for Injection*) and sterilise at 5 to 10 lbs. pressure for 30 minutes.

Characters. A clear brownish-red liquid. Odour, meaty; taste, characteristic. Slightly acidic to *solution of litmus*.

Tests for Identity. Treat 5 millilitres with *acetic acid* and *sodium nitrite*, a copious evolution of nitrogen occurs.

Treat 5 millilitres with *tannic acid* or *phosphotungstic acid*, a flocculent precipitate is produced.

Warm 5 millilitres with *Fehling's solution*, a copious precipitate of cuprous oxide is produced.

Heat 10 millilitres with a solution of *silver nitrate* in presence of excess of *nitric acid*, a precipitate is formed which dissolves readily in excess of *dilute solution of ammonia*.

Tests for Purity. Add 2 millilitres to 2 millilitres of a 4 per cent. w/v aqueous solution of *trichloracetic acid*; no precipitate is produced (absence of proteins, metaproteins and albumoses).

Saturate 10 millilitres with *sodium chloride*; no precipitate or turbidity is produced (absence of proteoses).

Saturate 10 millilitres with *ammonium sulphate*; no precipitate or not more than a very faint turbidity should be produced (limit of proteoses).

Treat 0·25 millilitre with 0·25 millilitre of a 5 per cent. solution of *p-dimethylaminobenzaldehyde* in *hydrochloric acid* and 5 millilitres of *hydrochloric acid*, and after an interval of 5 minutes, add 3 drops of a 0·2 per cent. solution

of *sodium nitrite*. A distinct blue colour develops immediately (presence of tryptophane).

Leaves, on evaporation to dryness on a water bath and subsequent drying in a vacuum desiccator, not less than 9·5 per cent. and not more than 12·0 per cent. of residue.

Complies with the Tests for *Absence of Undue Toxicity* (Protein Hydrolysate) and with the *sterility tests for* liquids.

Assay. Carry out the *Method of Estimation of total nitrogen.*

Storage. Protein Hydrolysate should be protected from light and kept in a cool place.

Packing. The label on each container shall state the quantity contained in each container, the name of the manufacturer, the date of manufacture, batch and lot number, and the date after which the product is not intended to be used.

DOSES

By intravenous injection.

Metric.	**Imperial.**
200 to 400 mils.	**7 to 15 fluid ounces.**

ISPAGHULA

[Ispagh.]

Ishabgul

Synonym. Psyllium Seeds.

Indian names Bengali and Hindi—*Isabgul ;* Kanarese—*Isabakolu ;* Kashmiri—*Ismoghul ;* Marathi—*Isabugola ;* Punjabi—*Bartang, Isafghal,* Tamil—*Isappukol-virai ;* Telegu—*Isapugula-vittulu.*

Ishabgul consists of the dried seeds of *Plantago ovata* Forsk. and other species of Plantago (Fam. *Plantagineæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Cymbiform, hard, translucent, pinkish grey to brown, smooth, from 1 millimetre to 3·5 millimetres long, and 1 millimetre to 1·75 millimetres broad, glossy reddish brown oval spot in the centre of the convex surface, concave surface contains the hilum covered with the remains of a thin white membrane. Endosperm, hard, cells thick-walled containing numerous pits and granular contents; embryo lies near the convex surface and has two cotyledons consisting of thin walled polyhydral cells containing fixed oil and aleurone grains. Testa, of large transparent polygonal cells. Taste, mucilaginous.

Tests for Purity. One hundred seeds weigh not less than 0·17 gramme and not more than 0·22 gramme.

One gramme, agitated gently and occasionally during twenty four hours in a 25 millilitre stoppered cylinder filled to the 20 millilitre mark with *water*, and allowed to stand for one hour, occupies a volume of not less than 10 millilitres.

F

Ash, not more than 3 per cent.; *acid-insoluble ash*, not more than 0·6 per cent.

Preparation. Ispaghula Testa.

Storage. Ishabgul should be stored in dry well-closed containers.

DOSES

Metric.	Imperial.
5 to 15 grammes.	75 to 225 grains.

ISPAGHULÆ TESTA

[Ispagh. Test.]

Isabgul Husk

Indian names. Bengali—*Ishabguler bhusi*; Hindi—*Ishabgul-ki-bhusi.*

Ishabgul Husk consists of the dry seed coats of the seeds of *Plantago ovata* Forsk (Fam. *Plantagineæ*), and is obtained by crushing the seeds and separating the husks by winnowing. It contains not more than 2 per cent. of other organic matter.

Characters. White or translucent, thin, boat-shaped structures, 2 to 3 millimetres long; 0·5 to 1 millimetres wide. Microscopically, elongated polygonal cells, 90 to 120 microns long, 18 to 27 microns wide, cellulose walled, thickened by secondary deposit. Odourless; taste, bland and mucilaginous.

Tests for Purity. *Ash*, not more than 2·9 per cent.; *acid-insoluble ash*, not more than 0·45 per cent.

1 gramme of the husk, agitated gently and occasionally for 4 hours in a 25 millilitre stoppered cylinder filled to the 20 millilitre mark with water and allowed to stand for 1 hour, occupies a volume of 20 millilitres and sets to a jelly.

DOSES

Metric.	Imperial.
0·5 to 2 grammes.	8 to 30 grains.

KALADANA

[Kalad.]

Kaladana

Indian names. Bengali—*Nilkalmi*; Hindi—*Mirchai, Kaladarma*; Kanarese, Punjabi, Singhalese and Urdu—*Kaladana*; Marathi—*Nilpusppi*; Tamil—*Tali.*

Kaladana consists of the dried seeds of *Ipomœa hederacea* Jacq. (Fam. *Convolvulaceæ*). It contains not more than 2 per cent. of other foreign organic matter.

Characters. Seeds, about 5·5 millimetres long, 3·7 millimetres wide; central shallow longitudinal groove on the curved surface; two flat faces meet at an angle of 60 to 85 degrees forming a ridge, near the proximal end of which is a cordate, hilar depression, brownish in colour, due to a dense covering of short brown hairs which do not project above the level of the general surface. Testa, dull black, hard, smooth and apparently glabrous; on magnification short trichomes become visible as white dashes. Longitudinal section shows two plaited cotyledons in which numerous resin

cells are visible, a narrow, mucilaginous endosperm which lines the testa and penetrates between the larger folds of the cotyledons, and a crescent shaped hypocotyl-radicle, the radicle end of which is bluntly pointed. 100 seeds weigh between 3 and 4 grammes. Taste, at first sweetish, subsequently acrid.

Tests for Identity. To 0·5 gramme of the resin, obtained by exhausting the powdered drug with *alcohol (90 per cent.)*, add 5 millilitres of *dilute solution of ammonia*, and shake well for 15 minutes. No red colour is produced in 15 minutes and the mixture exhibits a light blue fluorescence in filtered ultraviolet light.

Preparation. Pulvis Kaladanæ Compositum.

DOSES

Metric.	Imperial.
2 to 3 grammes.	30 to 45 grains.

KALMEGH

[Kalm.]

Kalmegh

Synonym. Andrographis.

Indian names. Bengali—*Kalmegh;* Hindi and Malayalam—*Kiryat;* Marathi—*Oleki rayat;* Sanskrit—*Bhunimba;* Tamil—*Nilavempu, Shirat kuchi:* Telegu—*Nelavemu.*

Kalmegh is the dried or fresh entire aerial portion of the plant *Andrographis paniculata* Nees. (Fam. *Acanthaceæ*). It contains not more than 2 per cent. of other foreign matter.

Kalmegh yields not less than 1 per cent. of andrographolide.

Characters. Annual herb, 1 to 3 ft. high. Stem, glabrous 2 to 6 millimetres thick, sharply quadrangular, dark green in colour, often narrowly winged in the upper part, with spreading branches. Leaves, decussate and opposite, deep green above, paler below, lanceolate, acute, thin, glabrous, and with entire, straight margin. Petioles, very short. Flowers, small, solitary, distant in lax spreading axillary and terminal racemes or panicles, the whole forming a pyramidal paniculate inflorescence. Bracts, lanceolate, 2 to 5 millimetres long. Bracteoles, if present, similar. Pedicles, glandular, pubescent. Sepals, linear, lanceolate, glandular, pubescent. Corolla, rose-coloured, hairy outside, 2-lipped, tube slightly enlarged below the limb. Upper lip, 2-lobed, lower, 3-lobed. Capsule, pubescent, linear, oblong; seeds, numerous, subquadrate, rugosely pitted, glabrous, yellowish brown, supported on retinacula.

Microscopically leaves show upper epidermis of straight walled cells, stomata absent. Lower epidermis of very much wavy walled cells, stomata abundant and large number of elongated cystoliths with blunt-end, some rounded cystoliths, and few glandular hairs are present on both the epidermis. Palisade cells one row thick, spongy cells with large number of air spaces and occupying more than half the thickness of the leaf, present. The mid-vein is slightly notched in the lower side and pointed in the upper side. Palisade ratio, 3·5 to 4·5. Stem, quadrangular, 4 multicellular projections at 4 corners made of collenchymatous tissue. The projections are at 90° angle with one side and 180° angle with the adjacent side of the stem. Cystoliths also occur in stem epidermis. Compact wood made of pitted and spiralled vessels occur, which in older tissue occupy most of the

internal space, leaving only a small hollow pith. Flowers and fruits have straight hairs whose ends are rounded and glandular. Andrographis, in powdered form, shows presence of large number of elongated cystoliths in the epidermal layers, with blunt ends. Absence of hairs, and typical dicot like development of spongy and palisade layers of cells. Large number of pitted and spiralled tissues of the xylem of stems are also present. Odourless, taste intensely bitter.

Assay. Exhaust about 20 grammes accurately weighed, of the powdered drug in a small soxhlet by means of chloroform. Evaporate the chloroform and wash the crude green mass with *benzene*. Extract the mass repeatedly with *ethyl acetate* till the residue gives no bitter taste. Combine the ethyl acetate extractives, evaporate and weigh.

Preparation. Extractum Kalmegh Liquidum.

KINO

[Kino]

Kino

Synonym. East Indian Kino: Malabar Kino: Madras Kino: Cochin Kino.

Indian names. Hindi—*Hira-dokhi;* Malayalam—*Vennap paska;* Tamil—*Kandamiruga-mirattam;* Telegu—*Gandamrugam nethuru.*

Kino is the juice, obtained from incisions in the trunk of *Pterocarpus marsupium* Roxb. (Fam. *Papilionaceæ*), heated to boiling and evaporated to dryness.

Characters. In small, angular, glistening, opaque, reddish-black brittle fragments; transparent and ruby red in thin laminæ. Odourless, taste, very astringent.

Partly soluble in *alcohol (90 per cent.)*; entirely insoluble in *ether*.

Tests for Identity. To a 5 per cent. w/v aqueous solution add *solution of ferric chloride*; a dark green precipitate is produced.

To a filtered 5 per cent. w/v aqueous solution add *solution of sodium hydroxide*; a reddish-violet colour is produced.

To 5 millilitres of a filtered 1 per cent. solution in cold *water*, add 2 millilitres of *N/10 iodine*; a slight precipitate is produced; add 0·5 millilitres of *dilute solution of ammonia*; the precipitate dissolves (distinction from Butea Kino).

To 5 millilitres of a filtered 1 per cent. solution in cold *water* add 2 millilitres of *N/10 iodine*; a slight precipitate is produced; boil for one minute, cool, and add 0·5 millilitre of *dilute solution of ammonia*; the precipitate is insoluble (distinction from Eucalyptus kino).

Tests for Purity. Stir about 1 gramme in powder accurately weighed, with 50 millilitres of boiling *water*, and decant the liquid through a filter into a 200 millilitre flask; stir the residue with two further quantities of 50 millilitres of boiling *water*, decanting the liquids through the filter; transfer the insoluble residue to the filter and wash with hot *water*; cool the filtrate and washings and make up to 200 millilitres with *water*; evaporate 50 millilitres to dryness in a flat-bottomed shallow dish, dry at 100°. The residue weighs not less than 0·1875 gramme (extractive soluble in boiling water).

Weigh accurately 2 grammes in powder, dried at 100° to constant weight, into a dried and tared paper extraction thimble, using a glass stoppered weighing bottle as the container and place 0·2 gramme of *sodium hydroxide* in the receiving flask. Extract the drug in a *continuous extraction* apparatus with alcohol (90 per cent.), for five hours. Dry the insoluble residue at 100° for thirty minutes, and weigh. The residue weighs not more than 0·8 gramme (alcohol insoluble residue).

Ash, not more than 2·5 per cent.

Preparation. Tinctura Kino.

KURCHI

[Kurch.]

Kurchi

Synonym. Holarrhena.

Indian names. Assamese—*Dutkhuri ;* Bengali—*Kurchi ;* Gujerathi—*Dhowda ;* Hindi—*Kurchi, Kura ;* Kanarese—*Hale ;* Malayalam—*Kodagapala ;* Marathi—*Kadu-indra-jon ;* Sanskrit—*Kutaja ;* Santali—*Hat ;* Tamil—*Kodagapala ;* Telegu—*Pala kodsa.*

Kurchi consists of the dried stem bark of *Holarrhena antidysenterica* Wall. (Fam. *Apocynaceæ*) collected from plants, 8 to 12 years old, freed from attached wood and peeled into small pieces.

It contains not more than 5 per cent. of other organic matter and not less than 2 per cent. of the total alkaloids of Kurchi, when assayed by the method given below.

Characters. Bark, buff-coloured, whitish-brown or brown coloured; 3 to 6 millimetres thick, paler outside, darker inside, attached wood light yellow in colour. Cut into small pieces with transverse and longitudinal cracks and slightly wrinkled surface. Inner surface of bark stratified, yellowish brown to dark brown in colour. Microscopically the bark consists mainly of secondary phlœm tissue, combined with variable amount of periderm. The phellogen and phelloderm cells are polygonal and nearly isodiametric in tangential sections, although they appear rectangular in transverse sections. The cells of phellem are loosely arranged in radial rows. The secondary phlœm consists of sieve tubes, with companion cells, parenchyma, phlœm ray cells, stone cells and special parenchyma cells containing secretory products. The sieve tubes form isolated groups, surrounded by other tissues. The phlœm parenchyma are rectangular cells and arranged in vertical rows, with the sieve tubes. Phlœm fibres very scarce or absent, and stone cells are the only form of sclerenchyma present. Stone cell walls coloured green with sulphuric acid. Continuous bands of stone cells found in barks from old and properly mature trees.

Tests for Purity. *Acid-insoluble ash*, not more than 1·0 per cent.

Assay. Take about 10 grammes of the drug in No. 60 powder, accurately weighed, and add to it with trituration a paste of *calcium oxide* (4 grammes) and *2N sodium hydroxide* (5 millilitres). Macerate for 5 hours, pack in a continuous extraction apparatus, and extract with *chloroform* on a water bath for 2 hours. Evaporate the chloroform taking care that the residue does not get quite dry. Shake the residue vigorously for 20 minutes with 30 millilitres of *N/1 hydrochloric acid* and transfer the acid extract to a separating funnel passing it through glass wool. Repeat the process 5 times with 20, 20, 20, 10 and 10 millilitres of *N/1 hydrochloric acid* shaking vigorously for 5 minutes during each extraction. Wash the acid layer

thrice with 20 millilitres of *ether* shaking each time for 5 minutes. Combine the ether washings and extract five times using 5 millilitres of *N/1 hydrochloric acid* each time and shaking. Return the acid washings to the main acid extract, filter the acid layer into another separating funnel, make very slightly alkaline with *3N sodium hydroxide* adding 5 millilitres more of alkali at the end. Extract the alkaline solution 5 times with 20 millilitre portions of *chloroform* until *complete extraction*. Wash the chloroform extract with 3 millilitres of *water*. Filter the chloroform layer into a tared dry conical flask. Wash the separating funnel and the filter paper twice with 5 millilitre portions of *chloroform* and add the washings to the main bulk. Distil off the chloroform on a water bath till about 2 millilitres are left. Add 2 millilitres of *dehydrated alcohol* and pass a current of dry air for 5 to 10 minutes. Dry in a vacuum desiccator to constant weight and weigh.

Storage. Kurchi should be stored in dry well-closed containers.

Preparations. Extractum Kurchi Liquidum.
Kurchi et Bismuthi Iodidum.

DOSES

Metric.	**Imperial.**
0·5 to 1 gramme.	**8 to 15 grains.**

KURCHI ET BISMUTHI IODIDUM

[Kurch. Bism. Iod.]

Kurchi-Bismuth Iodide

Kurchi-Bismuth Iodide is a combination of bismuth iodide with the total alkaloids of Kurchi, and may be prepared by dissolving the total alkaloids of Kurchi in dilute hydrochloric acid and then treating with Dragendorff-Kraut's reagent until precipitation is complete.

It contains not less than 23 and not more than 27 per cent. of total Kurchi alkaloids and not less than 18 and more than 24 per cent. of Bismuth.

Characters. Kurchi-Bismuth Iodide is a fine reddish-orange to dark-red powder; odourless; taste, bitter and acrid.

Solubility. Sparingly soluble in *water, alcohol* (*95 per cent.*), and in *hydrochloric acid.*

Assay. *For kurchi alkaloids.* Weigh accurately about 0·3 gramme of the substance in a 50 millilitre beaker and add 10 millilitres of *acetone*, add 1 millilitre of *concentrated hydrochloric acid* and warm slightly, if necessary. After the decomposition is complete (about 10 minutes), transfer the contents to a 250 millilitre separating funnel using a small quantity of *acetone* for rinsing the beaker. Add 20 millilitres of 5 per cent. w/v aqueous solution of *citric acid* and shake for 3 to 4 minutes. Make alkaline with *dilute solution of ammonia* and shake with successive quantities of *chloroform* until *complete extraction* of the alkaloid is effected (usually six extractions suffice) washing each chloroform solution with the same 5 millilitres of water contained in a second separator. Mix the chloroform solutions, remove the chloroform, add 2 millilitres of *alcohol* (*95 per cent.*), evaporate and dry at a temperature not exceeding 80° and weigh.

For bismuth. Dissolve about 0·5 gramme, accurately weighed, in 50 millilitres of *dilute nitric acid* and boil vigorously until iodine vapour is no longer expelled. Add *strong solution of ammonia* until a slight permanent precipitate is obtained, and redissolve the precipitate by means of 1 millilitre of *nitric acid*. Heat to boiling and while stirring vigorously, add slowly from a burette 30 millilitres of *solution of ammonium phosphate*. Dilute to 400 millilitres with boiling *water* and allow to stand for at least one hour on a water-bath, for the precipitate to settle. Filter through a tared asbestos-filled Gooch crucible, wash with a 3 per cent. w/v aqueous solution of *ammonium nitrate* made just acid with *nitric acid*. Dry and ignite gently. Each gramme of the residue is equivalent to 0·6875 gramme of Bi.

Storage. Kurchi-Bismuth Iodide should be preserved in dry air-tight containers.

DOSES

Metric.	**Imperial.**
0·3 to 0·6 gramme.	**5 to 10 grains.**

LIMONIS CORTEX

[Limon. Cort.]

Lemon Peel

Indian names. Bengali—*Baranebur khosa ;* Hindi—*Jambira-ka-chhilka.*

Lemon Peel is the outer part of the fresh pericarp of *Citrus medica* Linn. var. *limon* Linn. (Fam. *Rutaceæ*).

Characters. Outer surface, greenish yellow, smooth, oily, glossy, more or less pitted; only a small amount of the white spongy part of the pericarp on the inner surface; cavities, 600 to 800 microns in diameter with green oil glands 150 to 200 microns in diameter. In transverse section, epicarp consists of one layer of rectangular cutinised cells; hypodermis, not well organised; oil cavities situated below the epidermis; parenchymatour cells just below the epidermis contain yellowish green chromoplasts, occasionally few oxalate crystals. Odour, sweet and aromatic; taste, bitter.

Preparations. Tinctura Limonis.
Syrupus Limonis.

LINIMENTUM PSORALEÆ

[Lin. Psoral.]

Psoralea Liniment

Synonym. Babchi Ointment.

Psoralea Liniment is an oleo-resinous extract obtained from the powdered seeds of *Psoralea corylifolia* (Fam. *Papilionaceæ*), and may be prepared in the following way :—

Mix one pound of the seed in *No. 60 powder* thoroughly with one pound of Olive Oil or Arachis Oil and allow to stand overnight. Transfer the mixture to a tincture press, express the oil and subsequently

filter through cotton wool. Dilute the oleo-resinous extract so obtained with sufficient quantity of fresh Olive Oil or Arachis Oil to produce two pounds.

Storage. Psoralea Liniment should be kept in a well-closed container, and stored in a cool place.

LIQUOR ARSENICALIS

[Liq. Arsen.]

Arsenical Solution

Arsenical Solution contains the equivalent of 1 per cent. w/v of Arsenic Trioxide (limits 0·95 to 1·05).

Arsenic Trioxide in powder . . .	10 grammes.
Glycerin	100 millilitres.
Amaranth	20 milligrammes.
Chloroform Water, sufficient to produce .	1,000 millilitres.

Heat the Arsenic Trioxide with the Glycerin at 100° until a clear solution is obtained ; cool, add the Chloroform Water and Amaranth. Filter.

Assay. To 20 millilitres add about 3 grammes of *sodium bicarbonate,* and titrate with *N/10 iodine* using Starch as indicator. Each millilitre of *N/10 iodine* is equivalent to 0·004947 gramme of As_2O_3.

DOSES

Metric.	Imperial.
0·12 to 0·5 mil.	2 to 8 minims.

Arsenical Solution contains in 0·5 millilitre the equivalent of 0·005 gramme, and in 8 minims the equivalent of about 1/12 grain, of Arsenic Trioxide.

LIQUOR CHLORIDORUM TRIUM ISOTONICUS

[Liq. Chloridor. Tri. Isoton.]

Isotonic Solution of Three Chlorides

Synonym. Ringer's Solution.

Ringer's solution contains, in each 100 millilitres not less than 0·84 gramme and not more than 0·88 gramme of NaCl, not less than 25 milligrammes and not more than 35 milligrammes of KCl, and not less than 30 milligrammes and not more than 36 milligrammes of $CaCl_2 . 2H_2O$

No. 1—Non-sterile Isotonic Solution of Three Chlorides.

Sodium chloride	8·6 grammes.
Potassium chloride	0·30 gramme.
Calcium chloride	0·33 gramme.
Distilled Water, recently boiled, a sufficient quantity to make	1,000 millilitres.

Dissolve the three salts in a convenient quantity of recently boiled Distilled Water to make 1,000 millilitres and filter, returning the filtrate until free from suspended particles.

No. 2—Sterile Isotonic Solution of Three Chlorides Not for Parenteral Use.

Prepare the solution as directed under No. 1 and sterilise by *heating in an autoclave.* The solution complies with the *sterility tests for liquids.*

No. 3—Sterile Isotonic Solution of Three Chlorides for Parenteral Use.

Prepare the solution as directed under No. 1 replacing the Distilled Water by *Sterilised Water for Injection.* Place the solution in suitable containers and sterilise by *heating in an autoclave.* The solution complies with the *sterility tests for liquids* and the *test for absence of pyrogenic substances.*

NOTE. *Bacteriostatic agents must not be added.*

Characters. Clear and colourless; taste mildly saline; pH value, 5 to 7·5.

Tests for Purity. 20 millilitres used in the *limit test for heavy metals* gives a value of not more than 0·3 parts per million.

Arsenic limit, 0·2 parts per million.

Assay. *For calcium chloride.* Evaporate 100 millilitres accurately measured, to 20 millilitres, heat to boiling, and make alkaline with *dilute solution of ammonia.* Add *solution of ammonium oxalate,* by drops, until precipitation is complete, heat on a water bath for 2 hours, filter through hardened filter paper, and wash thoroughly with warm *water.* Puncture the filter, and wash the precipitate into a beaker by means of a stream of hot *water,* followed by 30 millilitres of *dilute sulphuric acid.* Heat to 80°, and titrate, with *N/100 potassium permanganate.* Deduct from the volume of *N/100 potassium permanganate* consumed the volume of the same *N/100 potassium permanganate* required to produce the same end-point in the same volumes of *water* and *diluted sulphuric acid* as used to make the precipitate. Each millilitre of *N/100 potassium permanganate* is equivalent to 0·000735 gramme of $CaCl_2 . 2H_2O$.

For potassium chloride. To 1·5 millilitre of *alcohol (95 per cent.)* in a 15 millilitre centrifuge tube add 5 millilitres of the solution, accurately measured, and mix thoroughly. Add by drops with continuous shaking 2 millilitres of *solution of sodium cobaltinitrite.* Allow to stand for 1 hour at room temperature. Centrifuge for 10 minutes at about 2,000 revolutions per minute or until the precipitate is firmly packed in the bottom of the tube. Decant the supernatant liquid and allow the precipitate to drain for 5 minutes. Wash the precipitate carefully with 5 millilitres of *alcohol (10 per cent.)* breaking the bulk of the precipitate by forcing the wash solution in a fine stream from the pipette. Centrifuge for 4 minutes and drain again. Dry the precipitate for 1 hour at 80° to 85° to remove all of the alcohol. Add 10 millilitres of *N/50 ceric sulphate* and 1 millilitre of *sulphuric acid,* which has been previously diluted with an equal volume of water, and heat on a water bath until all of the precipitate has disappeared. Cool to room temperature and titrate the excess of *N/50 ceric sulphate* with *N/50 ferrous ammonium sulphate* using 1 drop of *solution of orthophenanthroline* as the indicator. Each millilitre of *N/50 ceric sulphate* is equivalent to 0·0010 gramme of KCl.

For total chloride. Measure accurately 25 millilitres of the solution into a 200-millilitre volumetric flask, and dilute with 50 millilitres of *water.* Add while agitating, exactly 50 millilitres of *N/10 silver nitrate,* then add 5 millilitres of *nitric acid* and sufficient *water* to make exactly 200 millilitres and mix well. Filter through a dry filter into a dry flask, rejecting the first 20 millilitres of the filtrate; titrate the excess of *N/10 silver nitrate* in exactly 100 millilitres of the subsequent filtrate with *N/10 ammonium thiocyanate,* using 2 millilitres of *solution of ferric ammonium sulphate,* as indicator. Each millilitre of *N/10 silver nitrate* is equivalent to 0·005845 gramme of NaCl.

Storage. Ringer's Solution should be stored in air-tight containers.

NOTE. *Unless otherwise specified, No. 3 Sterile Isotonic Solution of Three Chlorides for Parenteral Use must be dispensed.*

LIQUOR HYDROGENII PEROXIDI

[**Liq. Hydrog. Perox.**]

Solution of Hydrogen Peroxide

Synonym. Liquor Hydrogenii Dioxidi.

Solution of Hydrogen Peroxide is an aqueous solution of hydrogen peroxide, which may be obtained by the interaction of water, barium peroxide, and dilute sulphuric acid, at a temperature below 10°. It contains not less than 2·5 per cent. w/v, and not more than 3·5 per cent. w/v, of H_2O_2, corresponding to about 10 times its volume of available oxygen.

Characters. A colourless liquid; odourless; taste, slightly acid. Rapidly decomposes in contact with oxidisable organic matter, and with certain metals; also, if allowed to become alkaline.

Tests for Identity. Decomposes with effervescence when heated, evolving oxygen.

Shake 1 drop with 2 millilitres of *dilute sulphuric acid,* 1 drop of *solution of potassium chromate,* and 2 millilitres of *ether;* the ethereal layer is coloured deep blue.

Tests for Purity. 10 millilitres, diluted with 20 millilitres of *water,* requires for neutralisation not more than 1 millilitre of *N/10 sodium hydroxide,* using *solution of methyl orange* as indicator (limit of acidity).

10 millilitres show no turbidity on the addition of 1 millilitre of *dilute sulphuric acid* (limit of barium).

Extract 100-millilitres with a mixture of 3 volumes of chloroform and 2 volumes of *ether,* using 50 millilitres, 25 millilitres, and 25 millilitres respectively, and evaporate the combined extract to dryness at room temperature. The residue weighs not more than 50 milligrammes (limit of preservative).

Add to 1 millilitre, 1 millilitre of *dilute solution of ammonia* and evaporate the liquid to dryness on a water bath. The residue gives a negative test for arsenic (limit of arsenic).

Leaves, on evaporation on a water-bath, not more than 0·2 per cent. w/v of residue.

Assay. Dilute 2 millilitres with 20 millilitres of *water,* add 10 millilitres of *dilute sulphuric acid,* and titrate with *N/10 potassium permanganate.* Each millilitre of *N/10 potassium permanganate* is equivalent to 0·0017 gramme of H_2O_2.

Storage. Solution of Hydrogen Peroxide should be kept in a bottle closed with a glass stopper or a paraffined cork, protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
2 to 8 mils.	30 to 120 minims.

LOBELIA

[Lobel.]

Lobelia

Synonym. Lobelia Herba.

Indian names. Bengali—*Bantamaku*; Gujerathi and Hindi—*Nali*; Malayalam—*Kattupukayila*; Marathi—*Devnal*; Sanskrit—*Devnal*; Tamil—*Kattuppugaiyilai.*

Lobelia consists of the dried aerial parts of *Lobelia nicotianifolia* Heyne. (Fam. *Campanulaceæ*), collected in October and November and dried in the shade. It contains not more than 60 per cent. of its stems and not more than 2 per cent. of other organic matter.

Lobelia is adjusted, if necessary, by the admixture in suitable proportion of Lobelia having a higher or lower alkaloidal content, to contain 0·3 per cent. of the total alkaloids, calculated as lobeline (limits, 0·28 to 0·32).

Characters. Stems, rounded, channelled, usually branched at the top, somewhat pubescent; green with a purplish tint; bear alternate leaves and leaf scars. Leaves, alternate, subsessile, obovate-lanceolate, acute, finely serrulate, nearly glabrous above, glabrous or pubescent beneath. Fruit, a 2-celled inflated capsule, sub-globose, longitudinally ribbed; seeds, small, ellipsoid, compressed, coarsely reticulate. Hairs on stems and leaves, unicellular, conical. Transverse section of stem shows endodermis and pericycle; latex vessels present in the phlœm. Pith characterised by lignified and pitted parenchyma. Upper epidermis of leaf composed of straight walled cells, numerous stomata; mesophyll contains single crystals and oil drops, laticiferous vessels present in the phlœm. Seed coat composed of yellowish brown polygonal cells with thick walls. Odour, almost none; taste, extremely acrid and irritating.

Tests for Purity. *Ash*, not more than 5 per cent, *acid-insoluble-ash* not more than 2 per cent.

Assay. Place about 10 grammes accurately weighed in *No. 60 powder*, with 10 grammes of *ignited sand* in a separator, provided with a plug of absorbent wool in the tube below the stopcock. Add 75 millilitres of a mixture of 4 volumes of *ether* and 1 volume of *alcohol* (*95 per cent.*); shake well, set aside for fifteen minutes, add 5 millilitres of *dilute solution of ammonia* and shake frequently during one hour. Allow the liquid to percolate into another separator; when the liquid ceases to flow, pack firmly, and continue the percolation, first with 25 millilitres of the ether-alcohol mixture, then with *ether*, until *complete extraction* of the alkaloids is effected. To the percolate add 30 millilitres of *N/1 sulphuric acid*, shake well, allow to separate and run off the lower layer. Continue the extraction, first with 25 millilitres,

then with successive quantities, each of 20 millilitres, of a mixture of 5 volumes of *N/2 sulphuric acid* and 1 volume of *alcohol* (*95 per cent.*), until *complete extraction* of the alkaloids is effected. Wash the mixed acid solutions with 10 millilitres of *chloroform* and run off the latter into a second separator containing 20 millilitres of *N/2 sulphuric acid*, shake, allow to separate and reject the chloroform. Repeat the extraction of the liquid in the first separator with two further quantities, each of 5 millilitres, of *chloroform*, transferring each to the second separator and washing with the same aqueous acid liquid as before. Transfer the acid liquid from the second separator to the first separator, make neutral to *solution of litmus* with *dilute solution of ammonia* and add 5 millilitres in excess. Shake with successive quantities, each of 10 millilitres, of *chloroform* until *complete extraction* of the alkaloids is effected. Wash the combined, chloroform solutions with 3 millilitres of *water*, filter through a small filter into a flask, and wash the filter with *chloroform*. Evaporate on a water-bath until about 2 millilitres remain; add 2 millilitres of *dehydrated alcohol* and evaporate to dryness in a current of air. Repeat the process using two further quantities, each of 2 millilitres of *dehydrated alcohol* and dry the residue for one hour at 80°. Dissolve the residue in 2 millilitres of *alcohol* (*95 per cent.*); add 10 millilitres of *N/50 sulphuric acid* and titrate with *N/50 sodium hydroxide*, using *solution of methyl red* as indicator. Each millilitre of *N/50 sulphuric acid* is equivalent to 0·00674 gramme of lobeline.

Preparation. Tinctura Lobeliæ Ætherea.

DOSES

Metric.	**Imperial.**
0·06 to 0·2 gramme.	1 to 3 grains.

LOTIO CALAMINÆ

[Lot. Calamin.]

Calamine Lotion

Calamine	150 grammes.
Zinc Oxide	50 grammes.
Glycerin	50 millilitres.
Rose Water, sufficient to produce	1,000 millilitres.

Triturate the Calamine and Zinc oxide with Glycerin and sufficient Rose Water to make a cream, and add sufficient Rose Water to produce the required volume.

LYCOPODIUM

[Lycopod.]

Lycopodium

Indian names. Nepalese—*Nagbeli*; Punjabi—*Walayati-bagan.*

Lycopodium consists of the spores of *Lycopodium clavatum* Linn. (Fam. *Lycopodiaceæ*).

Characters. Light, yellow, very mobile powder; spores are somewhat like a three-sided pyramid with convex base, from 25 to 40 microns in diameter; the outer surface reticulate, the reticulations being polygonal and formed by straight-sided delicate ridges which form a delicate fringe at the edges of the spores; when viewed with the rounded surface of the spore on the under side, a distinct triangular marking is seen, formed by the edges of the flat surfaces of the spore. Odourless; tasteless.

Tests for Identity and Purity. Not wetted by water but floats upon it; when boiled with water, it sinks.

Lycopodium thrown into a flame burns with a quick flash.

Boil a small quantity with *water* and cool; no bluish, purplish or reddish colour is developed on addition of a *solution of iodine* (absence of starch or dextrin).

Acid-insoluble ash, not more than 0·75 per cent.

MAGMA MAGNESIÆ

[**Magma Mag.**]

Milk of Magnesia

Milk of Magnesia is an aqueous suspension of magnesium hydroxide containing not less than 7 per cent. and not more than 8·5 per cent. of $Mg(OH)_2$.

Characters. White, opaque, more or less viscous suspension from which varying proportions of water may separate on standing.

Alkaline to *solution of litmus* and to *solution of phenolphthalein.*

Tests for Identity. A solution of 1 millilitre in 2 millilitres of *dilute hydrochloric acid* yields the reactions characteristic of magnesium.

Tests for Purity. To 5 millilitres of the clear filtrate from Milk of Magnesia add 3 drops of *sulphuric acid.* Evaporate to dryness on a water bath and then ignite gently to constant weight. The weight of the residue does not exceed 8 milligrammes (limit of soluble salts).

Filter about 25 millilitres and collect the middle portion of the filtrate. Dilute 5 millilitres of the filtrate with 40 millilitres of *water.* Add 1 drop of *solution of methyl red* and titrate the solution with *N/10 sulphuric acid* to a persistent pink colour. Not more than 0·4 millilitre of acid solution is required (limit of soluble alkalies).

To 1 millilitre add 2 millilitres of *dilute hydrochloric acid.* Slight effervescence is produced and the resulting solution is not more than slightly turbid (limit of carbonates).

Arsenic limit, 0·2 parts per million.

To 10 millilitres, add in small portions 25 millilitres of a mixture of 5 millilitres of *sulphuric acid* and 25 millilitres of *water.* Cool, add 70 millilitres of *alcohol* (*95 per cent.*) and allow the mixture to stand overnight. Warm the solution to 50° to dissolve any crystals of magnesium sulphate which might have separated and filter through a Gooch crucible which has been previously washed with *dilute sulphuric acid* and water, ignited at dull red heat, and weighed. Wash the precipitate several times with a mixture of 2 volumes of *alcohol* (*95 per cent.*) and 1 volume of *dilute sulphuric acid.* Dry and ignite the crucible and contents at a dull red heat to constant weight. The weight of the calcium sulphate so obtained does not exceed 26 milligrammes (limit of calcium).

To 5 millilitres add 6 millilitres of *dilute hydrochloric acid,* and evaporate the solution to dryness on water bath with frequent stirring. Dissolve the residue in 20 millilitres of *water* and filter. Add 2 millilitres of *dilute acetic acid* to the filtrate and dilute to 25 millilitres with *water.* Carry out the test for heavy metals the limit of which is 5 parts per million (limit of heavy metals).

Assay. Take, after thorough shaking, about 5 grammes in a tared stoppered flask and weigh accurately. Add 25 millilitres of *N/1 sulphuric acid,* and after solution is complete, titrate the excess of acid with *N/1 sodium hydroxide* using *solution of methyl red* as indicator. Each millilitre of *N/1 sulphuric acid* is equivalent to 0·02917 gramme of $Mg(OH)_2$.

Storage. Milk of Magnesia should be stored in air-tight containers.

DOSES

As an Antacid.

Metric.	Imperial.
1 to 4 mils.	15 to 60 minims.

As a Laxative.

8 to 16 mils.	120 to 240 minims.

NOTE. *To minimise the action of the glass container on milk of Magnesia, 0·1 per cent. citric acid may be added.*

One-half millilitre of a volatile oil or a blend of volatile oils, suitable for flavouring purposes, may be added to each 1,000 millilitres of Milk of Magnesia.

MALTUM

[Malt.]

Malt

Malt is the grain of one or more varieties of cereals *e.g.*, barley, *Hordeum vulgare* Linn.; wheat, *Triticum sativum* Linn.; cholam, *Sorghum vulgare* Linn. (Fam. *Gramineæ*), partially germinated artificially, and containing amylolytic enzymes.

A freshly prepared aqueous infusion of Malt leaves on drying a residue weighing not less than 10 per cent. of its weight.

Characters. Yellowish or amber-coloured grains. Crisp when broken, the interior surface being nearly white. Odour, agreeable, characteristic; taste, sweet.

Malt floats on cold water.

Tests for Purity. Mix 10 grammes in *coarse powder,* with 100 millilitres of *water,* and maintain the mixture at a temperature of from 50° to 55°C. for one hour, occasionally stirring. Place upon a filter, and when the liquid has passed through, wash the contents of the filter with *water,* in small portions, until the combined infusion and washings measure 200 millilitres. Evaporate to dryness on a water bath an aliquot portion of the freshly prepared aqueous infusion, dry the residue for one hour at 100° and weigh.

The acidity of Malt, determined by titrating an aliquot portion of the freshly prepared infusion with *N/10 sodium hydroxide*, using *solution of phenolphthalein* as indicator does not exceed 0·3 per cent., calculated as lactic acid (limit of acidity).

Storage. Malt should be protected from heat and moisture.

Preparation. Extractum Malti.

MEL

[**Mel**]

Honey

Indian names. Bengali, Hindi and Sanskrit—*Madhu* ; Gujerathi—*Madh* ; Malayalam—*Ten* ; Marathi—*Madh* ; Punjabi—*Shahd* ; Tamil —*Ten* ; Telegu—*Tene*.

Honey is a saccharine secretion deposited in the honeycomb by the bee, *Apis dorsata* and possibly other species of *Apis*, e.g., *Apis indica*, *Apis florea*, etc. (Fam. *Apidæ*). It is obtained either by allowing honey to drain from the comb or by submitting the honeycomb to pressure, or is prepared by melting honey of commerce, allowing the scum to rise to the surface and straining. It must be free from foreign substances such as parts of insects, leaves, etc., but may contain pollen grains.

Characters. Pale yellow to yellowish brown thick syrupy liquid, translucent when fresh, often becoming opaque and granular through crystallisation of dextrose. Odour, characteristic; taste, sweet and faintly acrid. Reaction, slightly acid to litmus.

Tests for Purity. *Specific gravity* (15·5°/15·5°), not less than 1·360; *optical rotation*, 0° to 11°, after decolourising with *decolourising charcoal* if necessary.

Dissolve 20 grammes in sufficient *water* to produce 100 millilitres. This solution complies with the following tests :—

10 millilitres complies with the *limit test for chlorides.*

25 millilitres complies with the *limit test for sulphates.*

Stir 10 millilitres with 5 millilitres of *ether*. Allow to separate, and draw off 2 millilitres of the ethereal layer into a small dish. Allow the ether to evaporate, and add to the residue one drop of *solution of resorcinol in hydrochloric acid* ; no persistent cherry-red, or brown-red, colour is produced, but at most a transient pink colour which fades in half a minute (absence of artificial invert sugar).

An aqueous solution (1 in 2) does not immediately change its colour when mixed with an equal volume of *dilute solution of ammonia* (absence of foreign colouring matter).

Boil about 2 grammes with 20 millilitres of *water*, cool and add 2 drops of *solution of iodine* ; no bluish green or reddish green colour develops (absence of starch or dextrines).

Leaves, on incineration, not more than 0·5 per cent. w/w of residue.

Storage. Honey should be stored in well-closed containers.

MYLABRIS

[Mylab.]

Mylabris

Synonym. Indian Blistering Beetle.

Indian names. Hindi—*Teleni-makkhi* ; Tamil—*Pinsttarin-i.*

Mylabris consists of the dried beetles, *Mylabris cichorii* Linn., *Mylabris pustulata* Thunb. and *Mylabris macilenta* (Order, *Coleoptera* ; Fam. *Meloidæ*). It yields not less than 1 per cent. of cantharidin, $C_{10}H_{12}O_4$.

Characters. Head, subglobular ; antennæ, black with eleven joints, arcuate and enlarged at the end ; mandibles have numerous needle like teeth on the projecting convex base of the inner surface ; right mandible has well-developed tooth on the inner margin just behind the tip ; left mandible, without such tooth ; elytra, black, marked by spots and bands, orange-yellow or bright-red ; remainder of the body black.

M. cichorii and *M. macilenta.* 12 to 20 millimetres long, 3 to 6 millimetres wide ; elytra, yellow bands, yellow pubescence.

M. pustulata. 28 millimetres long, 10 millimetres wide ; elytra, bands and spots bright red.

Tests for Purity. Mylabris loses on heating at 100° not more than 15 per cent. of volatile matter.

Assay. Digest 1 to 5 grammes of powder with 20 millilitres of *hydrochloric acid* in a 300 millilitre flask for 10 minutes on a water-bath. Add 100 millilitres of hot *water* and leave the flask on the bath for a further 20 minutes. Filter the hot decoction through a rapid filter paper, rinse the flask with two portions of hot *dilute hydrochloric acid* (15 millilitres each), and wash the residue thrice with *dilute acid.* Cool the filtrate and transfer to a 300 millilitre separator (A).

Extract the filtrate by shaking with 3 portions (60, 50 and 40 millilitres) of a mixture of equal volumes of *chloroform* and *ether.* Combine the first two extracts in a smaller separator (B) and wash them first with 20 millilitres of 50 per cent. w/v *sodium bicarbonate* solution and then with 20 millilitres of *water* in a third separator (C). Filter the washed extract through a small filter paper into a small flask. Wash the third portion of the chloroform-ether extract (from A) with the washed liquid left in the 2nd and 3rd separators (B & C) and pass it through the same filter paper into the boiling flask. Distil off the solvent on a water-bath.

Add to the residue in the boiling flask 10 millilitres of *nitric acid* and about 0·1 gramme of *sodium nitrite* and heat the flask on the water-bath. Repeat the addition of *sodium nitrite* twice at 30 minutes intervals and leava the flask on the bath for a further 30 minutes after the final addition. Add 40 millilitres of *water*, allow the solution to cool, transfer it to a small separator and extract with 3 portions (15, 10, 10) of *chloroform.* (It is advisable to rinse the flask with the first portion of *chloroform* to dissolve any traces of cantharidin that might have separated on diluting the acid solution.) Combine the first two portions of the extract and wash them successively with 8 millilitres of 5 per cent. w/v aqueous solution of *sodium carbonate* and 8 millilitres of *water.* Wash the third portion of the extract with the washing liquid left in the second and third separators and press it through the same filter paper (c.f. above). Evaporate the *chloroform,* dry the residue for 30 minutes at 60°, cool in a desiccator and weigh.

Storage. Mylabris should be stored in tightly-closed containers.

NOTE. *Used as a source of Cantharidin.*

MYROBALANUM

[Myrobal.]

Myrobalan

Indian names. Assamese—*Hilikha*; Bengali—*Haritaki*; Kanarese—*Kadukko*; Gujerathi—*Hirdo*; Hindi—*Harara*; Marathi—*Harda*; Oriya—*Harada*, *Horitoki*; Punjabi—*Harir*; Sanskrit—*Haritaki*; Santali—*Rol*; Tamil—*Kadukkai*; Telegu—*Haritaki*.

Myrobalan consists of the dried fruits of *Terminalia chebula* Retz. (Fam. *Combretaceæ*) usually distinguished in commerce as chebulic myrobalans, and are obtained in two forms, *viz.*, the semi-mature fruits, and the young fruits of a smaller size.

Characters. *Semi-mature fruits.* Yellowish brown, ovoid, 20 to 35 millimetres long, 13 to 25 millimetres wide, wrinkled longitudinally; carpel, 5 to 6 ribbed longitudinally; hard and stony; seed, light yellow, 15 to 25 millimetres long, surface rough. Pulp, 3 to 4 millimetres thick, non-adherent to the seed. Odourless; taste, astringent, later sweetish.

Young fruits. Deep brown to black, elongated ovoid shape, both sides tapering, scar of the peduncle on one side, much smaller in size than the semi-mature fruits, often compressed, hard, with longitudinal ribs and wrinkle. Odourless; taste, astringent and bitter.

Microscopically, epicarp forms several layers of corky cells, often containing few starch grains. Mesocarp, of round parenchymatous cells, having brownish cell content. In young fruits, numerous stellate crystals of calcium oxalate. In semi-mature fruits, crystals common, not spherical. Starch, absent. Parenchymatous cells have cellulose walls. In semi-mature fruits, isolated vascular strands and sometimes long strands of vessels are intermingled with parenchyma tissue. All these vessel walls have pitted thickening.

Myrobalan, in powder, shows pitted vessels, rounded parenchyma cell containing resins and oils of brownish colour; starch, absent.

DOSES

Metric.	Imperial.
2 to 4 grammes.	30 to 60 grains.

OLEUM AJOWAN

[Ol. Ajowan.]

Ajowan Oil

Synonym. Ptychotis Oil.

Indian names. Bengali—*Jowaner tel*; Gujerathi—*Ajamunu tel*; Hindi—*Juaki tel*; Marathi—*Owai-tela*.

Ajowan oil is the oil distilled from the fruits of *Carum copticum* Benth. (Fam. *Umbelliferæ*).

It contains not less than 40 per cent. v/v of thymol, $C_{10}H_{15}O$.

Characters. Colourless or brownish liquid becoming darker on keeping; odour and taste resemblin thyme.

Soluble in 4 parts of *alcohol (90 per cent)*.

Tests for Identity and Purity. *Specific gravity* (15°/15°), 0·910 to 0·930; optical rotation, 0° to +2°; *refractive index* at 20°, 1·485 to 1·510.

Assay. Place 80 millilitres of *solution of potassium hydroxide* in a long necked flask of about 150 millilitres capacity, graduated on the neck in tenths of a millilitre and of such a diameter that not less than 15 centimetres in length is equivalent to 10 millilitres. The flask before use must be cleaned with *sulphuric acid* and well rinsed with *water*. Add 10 millilitres of the oil, cleared by filtration if necessary, and shake thoroughly at five minute intervals for half an hour, at laboratory temperature. Raise the unabsorbed oil into the graduated portion of the neck of the flask by the gradual addition of more *solution of potassium hydroxide*; allow to stand for not less than twenty-four hours, and read off the volume of the unabsorbed oil. The unabsorbed oil measures not more than 6 millilitres corresponding to not less than 40 per cent. v/v of thymol.

Storage. Oil of Ajowan should be kept in a well-closed container protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·03 to 0·2 mil.	1/2 to 3 minims.

OLEUM AURANTII FLORIS

[Ol. Aurant. Flor.]

Oil of Orange Flower

Synonym. Oleum Neroli : Oil of Neroli.

Oil of Orange-flower is the oil obtained by distillation with water from the fresh blossoms of the bitter-orange tree, *Citrus aurantii* Linn.

Characters. Pale yellow liquid, becoming brownish-red on exposure to light. Odour, characteristic; taste, aromatic and bitter.

Soluble in twice its volume of *alcohol (80 per cent.)*, the solution becoming turbid on the addition of more of the *alcohol (80 per cent.)*. The alcoholic solution has a fine violet blue fluorescence.

Tests for Purity. *Specific gravity* (25°/25°), 0·870 to 0·885; *optical rotation*, 0° to +8°; *refractive index* at 20°, 1·468 to 1·477; *saponification value*, not more than 70.

Storage. Oil of Orange-flower should be kept in a well-closed container protected from light, and stored in a cool place.

OLEUM CASSIÆ

[Ol. Cass.]

Oil of Cassia

Oil of Cassia is the volatile oil distilled with steam from the leaves and twigs of *Cinnamomum cassia* (Linn.) Blume (Fam. *Lauraceæ*) rectified by distillation.

It contains not less than 75 per cent. by volume of the total aldehydes, calculated as cinnamic aldehyde, C_9H_8O.

Characters. Yellowish or brownish oil, becoming darker and thicker on keeping; odour and taste, characteristic.

Soluble in an equal volume of *alcohol (95 per cent.)*, in 2 volumes of *alcohol (70 per cent.)* and in an equal volume of *glacial acetic acid*.

Tests for Identity and Purity. *Specific gravity* (25°/25°), 1·045 to 1·063; *optical rotation* at 25°/25°, —1° to +1° in a 100 millimetre tube; *refractive index* at 20°, 1·6020 to 1·6135.

A solution (1 in 2) of recently rectified oil in *alcohol (70 per cent.)* is slightly acid to moistened *blue litmus paper*.

Dissolve 1 drop in 5 millilitres of *alcohol (90 per cent.)* and add one drop of *solution of ferric chloride;* a blue or deep brown colour is produced.

Conforms with the requirements of the *test for heavy metals in volatile oils.*

Rinse the inner surface of a well cleaned, 1000 millilitre beaker with successive portions of *water*, passing the washings through a small filter until the last filtered washing, acidulated with 1 drop of *nitric acid* and treated with 1 drop of a *solution of silver nitrate*, shows no turbidity. Place 3 or 4 drops of the Oil on a clean watch glass supported on a triangle, ignite the oil, and immediately invert the moistened beaker over it. Wash the products of combustion from the sides of the beaker through the washed filter with 10 to 20 millilitres of *water*, acidulate the filtrate with 1 drop of *nitric acid* and add 1 drop of *solution of silver nitrate*. The mixture does not become turbid (absence of halogens and synthetic products). Shake 2 millilitres in a test tube with 5 to 10 millilitres of *light petroleum*, allow to separate and decant the petroleum layer, which is but slightly coloured, into another test tube. Shake the solution in the test tube with an equal volume of *cupric acetate* solution (1 in 1000). The mixture does not assume a green colour (absence of resin oils).

Assay. Place 10 millimetres, measured from a pipette, in a 100 millilitre flask with a long graduated neck, and add 50 millilitres of a saturated solution of *sodium sulphite*, rendered neutral, to 2 drops of *solution of phenolphthalein* by the addition of a 30 per cent. w/v aqueous solution of *sodium bisulphite*. Heat the mixture on a boiling water bath and shake the flask repeatedly, neutralising the mixture from time to time by the addition of a few drops of the *sodium bisulphite* solution. When no colouration appears upon the addition of a few drops of *solution of phenolphthalein*, and heating for 15 minutes, cool the mixture to room temperature, and when the liquids have separated completely, add sufficient *sodium sulphite* solution to raise the lower limit of the oily layer within the graduated portion of the neck. The volume of the oily layer does not exceed 2·5 millilitres, indicating the presence of not less than 75 per cent. by volume of total aldehydes.

Storage. Oil of Cassia should be stored in air-tight containers and kept in a cool place.

DOSES

Metric.	Imperial.
0·2 to 0·6 mil.	1 to 3 minims.

OLEUM CHAULMOOGRÆ

[Ol. Chaulmoog.]

Chaulmoogra Oil

Indian names. Bengali—*Chaulmoogra tel.*

Chaulmoogra oil is the fatty oil obtained by cold expression from the fresh ripe seeds of *Hydnocarpus kurzii* (King) Warb. (Fam. *Flacourtiaceæ*) or of other species of *Hydnocarpus*.

Characters. Yellow or brownish yellow oil. Below 25°, a whitish soft solid; odour, characteristic, resembling that of rancid butter; taste, somewhat acrid.

Sparingly soluble in *alcohol* (*90 per cent.*); soluble in *benzene*, in *chloroform* and *ether*.

Tests for Identity and Purity. *Specific gravity* (25°/25°), 0·937 to 0·970; *specific rotation*, determined by dissolving 10 grammes of the oil in *chloroform* and diluting to 100 millilitres with the same solvent, not less than +48° and not more than +60°; *saponification value*, 196 to 213; *acid value*, 20 to 30; *iodine value*, 96 to 104.

Storage. Chaulmoogra oil should be kept in well-closed containers in a cool place and protected from light.

Preparation. Unguentum Chaulmoogræ.

NOTE. *Intended for external use.*

OLEUM CHENOPODII

[Ol. Chenopod.]

Oil of Chenopodium

Synonym. Oil of American Wormseed.

Indian names. Bengali—*Bethusager tel.*; Hindi—*Chandanbethu-ka-tel.*

Oil of Chenopodium is the oil distilled with steam from the fresh flowering and fruiting plants, excluding roots, of *Chenopodium album* Linn (Fam. *Chenopodiaceæ*). It contains not less than 40 per cent. w/w of ascaridole, $C_{10}H_{16}O_2$.

Characters. A colourless, or light yellow, liquid; odour, characteristic and unpleasant; taste, bitter and burning.

Tests for Identity and Purity. 1 millilitre, heated to incipient ebullition in a test-tube with a fragment of unglazed porcelain, continues to boil vigorously for some seconds after removal from the flame, and leaves after cooling a deep golden-yellow liquid. (This test should be carried out very cautiously as the oil is liable to explode.)

Specific gravity (15·5°/15·5°), 0·90 to 0·94; *optical rotation*, +1° to −10°.

Assay. Dissolve about 2·5 grammes, accurately weighed, in sufficient *acetic acid* (*90 per cent.*) to produce 50 millilitres and place the solution in a burette. Into a stoppered tube, of about 60 millilitres capacity, place 3 millilitres of an 83 per cent. w/v aqueous solution of *potassium iodide*. 5 millilitres of

hydrochloric acid and 10 millilitres of *glacial acetic acid*; immerse the tube in a freezing mixture until the temperature is reduced to —3°, then add 5 millilitres of the acetic acid solution of the oil, mixing it with the reagent as quickly as possible, and making due allowance for the draining of the burette. Set aside in a cool place for five minutes and, without diluting, titrate the liberated iodine with *N/10 sodium thiosulphate*. At the same time, carry out the operation without the oil, but dilute the reagent with 20 millilitres of *water* before titrating the liberated iodine. The difference between the two titrations represents the iodine liberated by ascaridole. Each millilitre of *N/10 sodium thiosulphate* is equivalent to 0·00665 gramme of $C_{10}H_{16}O_2$.

Storage. Oil of Chenopodium should be protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·3 to 1·2 mil.	5 to 20 minims.

OLEUM CINNAMOMI FOLII

[Ol. Cinnam. Fol.]

Cinnamon Leaf Oil

Cinnamon Leaf Oil is the oil distilled from the leaves of *Cinnamomum cassia* Linn. (Fam. *Lauraceæ*), and other species of *Cinnamomum*.

It contains not less than 70 per cent. and not more than 90 per cent. v/v of Eugenol, $C_{10}H_{12}O_2$.

Characters. A dark-brown limpid liquid. Odour, penetrating, fragrant, resembling those of cinnamon and clove; taste, very pungent.

Tests for Identity and Purity. Soluble in 3 volumes of *alcohol (70 per cent.)*; *specific gravity* (30°/30°), 1·0443 to 1·0680; *refractive index* at 30°, 1·5223 to 1·5305.

Assay. Place 80 millilitres of *solution of potassium hydroxide* in a flask of about 150 millilitres capacity with a long neck, which is graduated in tenths of a millilitre, and is of such a diameter that not less than 15 centimetres in length is equivalent to 10 millilitres. The flask before use must be cleansed with *sulphuric acid* and well rinsed with *water*. Add 10 millilitres of the oil, cleared by filtration if necessary, and shake thoroughly at five minute intervals for half an hour, at laboratory temperature. Raise the unabsorbed oil into the graduated portion of the neck of the flask by gradual addition of more of the *solution of potassium hydroxide*; allow to stand for not less than twenty-four hours, and read off the volume of the unabsorbed oil. The unabsorbed oil measures not less than 1·0 millilitres, and not more than 3·0 millilitres, indicating the presence of not less than 80 per cent. v/v, and not more than 90 per cent. v/v, of eugenol.

Storage. Cinnamon Leaf Oil should be kept in a well-closed container, protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·06 to 0·2 mil.	1 to 3 minims.

NOTE. *Unless otherwise stated, Cinnamon Leaf Oil may be used in place of Clove oil.*

OLEUM COCOIS

[Ol. Cocois]

Coconut Oil

Indian names. Bengali—*Narikel-tel*; Gujerathi—*Naryal-nu-tel*; Hindi—*Narial-ka-tel*; Kanarese—*Cobri-yenney*; Malayalam—*Tennaenna*; Marathi—*Naral-tela*; Tamil—*Tenga-yenney*; Telegu—*Tankaia-nunay*.

Coconut Oil is a fat obtained by expression from the kernels of coconut, the fruit of *Cocos nucifera* Linn. and *Cocos butyraceæ* Linn. (Fam. *Palmæ*).

Characters. Almost colourless or pale yellow transparent liquid solidifying at temperatures below 20°; below 15°, it is a hard, solid, pearl-white fat; fracture, characteristic. Odour, reminiscent of coconut; taste, bland and agreeable.

Soluble in 2 parts of *alcohol (95 per cent.)* at 60°, less soluble at lower temperatures; readily soluble in *ether*, in *chloroform* and in *carbon disulphide*.

Tests for Purity. *Specific gravity (35°/35°)*, 0·9135 to 0·9173; *saponification value*, not less than 250; *Reichert-Meissl value*, 6·5 to 9; *Polenske value*, 14 to 20; *Butyrorefractometer reading*, 33 to 35·5 at 40°.

Storage. Coconut oil should be kept in a well-closed container in a cool place.

OLEUM CUMINI

[Ol. Cumin.]

Oil of Cumin

Indian names. Bengali—*Jirar tel*; Gujerathi—*Jirangi-nu-tel*; Hindi —*Jirigiri-tel*; Marathi—*Jiru-tela*.

Oil of Cumin is the oil distilled from the fruits of *Cuminum cyminum* Linn. (Fam. *Umbelliferæ*).

Oil of Cumin contains not less than 16 per cent. w/w cuminic aldehyde, $C_{10}H_{12}O$.

Characters. Colourless or pale yellow liquid when fresh, becoming darker on keeping. Odour, characteristic, unpleasant; taste, spicy, somewhat bitter.

Soluble in 11 volumes of *alcohol (80 per cent.)*.

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·8900 to 0·935; *optical rotation*, +3° to +8°; *refractive index* at 20°, 1·490 to 1·509.

Assay. Weigh accurately in a stoppered tube about 1·5 grammes of oil; add 12 millilitres of N/2 *hydroxylamine hydrochloride reagent* prepared with *alcohol (60 per cent.)* and a drop of *solution of methyl orange* as indicator; shake well and titrate with *N/2 alcoholic potassium hydroxide*; each millilitre of *N/2 alcoholic potassium hydroxide* is equivalent to 0·0743 gramme of cuminic aldehyde, $C_{10}H_{12}O$.

Storage. Oil of Cumin should be kept in glass stoppered bottle in a cool place and protected from light.

DOSES

Metric.	Imperial.
0·12 to 0·25 mil.	2 to 4 minims.

OLEUM EUCALYPTI

[Ol. Eucalyp.]

Oil of Eucalyptus

Indian names. Hindi—*Neeli-gond-ka-tel* ; Tamil—*Karpura maram-yenney.*

Oil of Eucalyptus is the oil distilled from the fresh leaves of *Eucalyptus globulus* Labill. or from other species of *Eucalyptus* (Fam. *Myrtaceæ*), and rectified. It contains not less than 55 per cent. w/w of cineole, $C_{10}H_{18}O$.

Characters. Colourless or pale yellow liquid; odour, aromatic and camphoraceous; taste, pungent and camphoraceous, followed by a sensation of cold.

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·9065 to 0·9155 *optical rotation*, —5° to +10° ; *refractive index* at 20°, 1·4580 to 1·4700.

Soluble in 1 volume of *alcohol* (*80 per cent.*).

A solution of recently distilled Oil of Eucalyptus in an equal volume of *alcohol* (*80 per cent.*) is neutral to moistened *red* or *blue litmus paper.*

Mix 1 millilitre with 2 millilitres of *glacial acetic acid* and 5 millilitres of *light petroleum* (boiling point, 50° to 60°) add 2 millilitres of a saturated aqueous solution of *sodium nitrite* and shake the mixture gently ; no crystalline precipitate forms in the upper layer (*limit* of *phellandrene*).

Carry out the *method for the determination of aldehydes in volatile oils*, using 10 millilitres of Oil of Eucalyptus with 4 millilitres of *hydroxylamine hydrochloride reagent in alcohol* (*60 per cent.*) and 5 millilitres of *benzene* ; not more than 2 millilitres of *N/2 potassium hydroxide in alcohol* (*60 per cent.*) is required (limit of aldehydes).

Assay. Carry out the *method for the determination of cineole.*

Storage. Oil of Eucalyptus should be kept in a well-closed container, protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·06 to 0·2 mil.	1 to 3 minims.

OLEUM FŒNICULI

[Ol. Fœnic.]

Oil of Fennel

Indian names. Bengali—*Panmaurir-tel* ; Hindi—*Sonph-ka-tel* ; Marathi—*Badisheptela.*

Oil of Fennel is the volatile oil distilled with steam from the dried ripe fruits of *Fœniculum panmorium* D.C. (Fam. *Umbelliferæ*).

Characters. Colourless or pale yellow oil. Odour and taste, characteristic. Soluble in 1 volume of *alcohol* (*90 per cent.*).

A solution of recently distilled oil in *alcohol* (*90 per cent.*) is neutral to moistened *red* or *blue litmus paper.*

Tests for Identity and Purity. *Specific gravity* at (25°/25°), 0·956 to 0·976; *congealing point,* not below 3°; *optical rotation* at 25°, +11° to +24°; *refractive index* at 20°, 1·5280 to 1·5380.

Oil of Fennel complies with the *test for heavy metals in volatile oils.*

Storage. Oil of Fennel should be stored in securely closed containers.

Preparation. Aqua Fœniculi.

DOSES

Metric.	Imperial.
0·03 to 0·2 mil.	1/2 to 3 minims.

OLEUM GAULTHERIÆ

[Ol. Gaulth.]

Oil of Gaultheria

Synonym. Oil of Wintergreen.

Indian name. Hindi—*Gandupura-ka-tel.*

Oil of Wintergreen is the oil distilled from the fresh plant, *Gaultheria fragrantissima* Wall. (Fam. *Ericaceæ.*). It contains not less than 98 per cent. of esters calculated as methyl salicylate, $C_8H_8O_3$.

Characters. Colourless or nearly colourless oil. Odour, strong, characteristic; taste, pungent.

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 1·180 to 1·187; *optical rotation* at 25°, 0° to —1°; *refractive index* at 20°, 1·537 to 1·539.

Soluble in 6 parts of *alcohol (70 per cent.).*

Assay. Carry out the *method for the determination of esters in volatile oils.*

Storage. Oil of Wintergreen should be kept in a well-closed container, protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·3 to 1 mil.	5 to 15 minims.

OLEUM GRAMINIS CITRATI

[Ol. Gram. Citrat.]

Oil of Lemon Grass

Indian names. Bengali—*Gandha-benar-tel;* Hindi—*Gandha-bina-ka-tel;* Marathi—*Hirvacha-tela.*

Oil of Lemon Grass is the oil distilled from *Cymbopogon citratus* Stapf. and *Cymbopogon flexuosus* Stapf. (Fam. *Gramineæ*).

It contains not less than 70 per cent. w/w of aldehydes calculated as citral, $C_{10}H_{16}O$.

Characters. Dark yellow oil. Odour, resembling that of verbena. Almost entirely soluble in 3 parts of *alcohol (70 per cent.)*, solubility gradually decreasing on storage.

Tests for Purity. *Specific gravity* (15·5°/15·5°), 0·880 to 0·905; *optical rotation*, —3° to +3°; *refractive index* at 20°, 1·4820 to 1·4880.

Assay. Carry out the method for the *determination of aldehydes in volatile oils.* Each millilitre of *N/2 potassium hydroxide* in *alcohol (60 per cent.)* is equivalent to 0·07667 gramme of citral.

Storage. Oil of Lemon Grass should be kept in a well-closed container protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·03 to 0·2 mil.	1/2 to 3 minims.

OLEUM HYDNOCARPI

[Ol. Hydnocarp.]

Hydnocarpus Oil

Indian names. Bengali—*Chalmoogra tel*; Hindi—*Kava-ka-tel*; Malayalam—*Morotti-yenna.*

Hydnocarpus oil is the fatty oil, obtained by cold expression from the fresh ripe seeds of *Hydnocarpus wightiana* Blume (Fam. *Flacourtiaceæ*). The fixed oil expressed from the ripe seed of other species of *Hydnocarpus* (Fam. *Flacourtiaceæ*) when designated as such and when conforming to the description and physical properties and meeting the requirements of the tests prescribed below may be used.

Characters. Yellow or brownish yellow oil; at a temperature of about 25° or below, a whitish, solid. Odour, characteristic; taste, somewhat acrid.

Sparingly soluble in *alcohol (95 per cent.)*; soluble in *benzene*, in *chloroform*, and in *ether*.

Tests for Identity and Purity. *Specific gravity* (25°/25°), 0·940 to 0·960; *specific rotation*, determined by dissolving 10 grammes of the oil in *chloroform* and diluting to 100 millilitres with the same solvent, not less than +53°; *refractive index* at 40°, 1·472 to 1·476; *acid value*, not more than 5 for oils meant for injection and not more than 10 for oils to be used for the preparation of ethyl ester; *saponification value*, 198 to 204; *iodine value*, 92 to 103; *peroxide value*, not more than 2.

Place 25 millilitres in a measuring tube consisting of a glass stoppered pear-shaped bulb of not less than 100 millilitres capacity, joined at its lower tapering end to a tube about 30 centimetres long and graduated to 25 millilitres in divisions of 0·1 millilitre. Add 100 millilitres of *neutralised alcohol*, and shake the mixture thoroughly for not less than 10 minutes. Allow the tube to stand for 24 hours. The volume of the lower layer should not be less than 23·5 millilitres (limit of castor oil or free fatty acids).

Storage. Hydnocarpus oil should be kept in a well-closed container, protected from light, and stored in a cool place.

Preparation. Oleum Hydnocarpi Æthylicum.

DOSES

Metric.	Imperial.
0·3 to 1 mil. increasing gradually to 4 mils.	5 to 15 minims, increasing gradually to 65 minims.
By subcutaneous and intramuscular injection.	
2 mils. increasing gradually to 5 mils.	30 minims, increasing gradually to 80 minims.

OLEUM JUNIPERI

[Ol. Junip.]

Oil of Juniper

Oil of Juniper is the volatile oil distilled with steam from the dried ripe berries of *Juniperus macropoda* Boiss. (Fam. *Pinaceæ*).

Characters. A colourless liquid. Odour, aromatic ; taste, warm, aromatic and bitter.

Dissolves in 4 volumes of *alcohol (95 per cent.)* with a clear solution. Miscible in all proportions with *chloroform, benzene, carbon disulphide,* and *amyl alcohol.*

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·840 to 0·850 ; *refractive index* at 20°, 1·470 to 1·4805 ; *optical rotation,* +13° to +18°.

Storage. Oil of Juniper should be kept in a well-closed container, protected from light, and stored in a cool place.

DOSES

Metric.	Imperial.
0·03 to 0·2 mil.	1/2 to 3 minims.

OLEUM NEEM

[Ol. Neem.]

Neem Oil

Neem Oil is the oil expressed from the seeds of *Melia azadirachta* Linn. (Fam. *Meliaceæ*), collected late in summer, and filtered.

Characters. Deep yellow ; odour, strongly disagreeable ; taste, bitter and acrid.

Tests for Purity. *Specific gravity* (25°/25°), 0·900 to 0·920 ; *refractive index* at 25°, 1·440 to 1·480 ; *iodine value,* 65 to 70 ; *saponification value,* 196 to 200 ; *acid value,* not less than 22.

Storage. Neem Oil should be stored in well-closed containers.

NOTE. *Intended for local application.*

OLEUM PUDINÆ

[Ol. Pudin.]

Pudina Oil

Pudina Oil is the oil distilled from the fresh leaves of *Mentha arvensis* Linn. (Fam. *Labiatæ*). It contains not less than 75 per cent. of carvone, $C_{10}H_{14}O$.

Characters. A transparent deep green liquid. Odour, characteristic; taste, pungent and aromatic. It becomes turbid at —2°, but does not congeal even on cooling up to —40°. On warming, the turbidity clears at 16°.

Specific gravity (15·5°/15·5°), 0·9400 to 0·9405; *optical rotation* at 33°, +73·0° to +75·0°; *refractive index* at 25°, 1·4800 to 1·4845.

Assay. Carry out the *method for the determination of carvone in Oil of Caraway and in Oil of Dill.*

Storage. Pudina Oil should be kept in well-closed containers, protected from light, and stored in a cool place.

Preparations. Aqua Pudinæ Concentrata.
Aqua Pudinæ Destillata.
Spiritus Pudinæ.

DOSES

Metric.	Imperial.
0·06 to 0·2 mil.	1 to 3 minims.

OLEUM SELACHOIDEI

[Ol. Selachoid.]

Shark-Liver Oil

Shark-Liver Oil is the oil obtained from fresh or carefully preserved livers of the various species of Shark, chiefly *Zygœna tudes* (Fam. *Carchariidæ, S. O. Selachoidei*).

It contains, in 1 gramme, not less than 10,000 *International Units of vitamin A activity.*

Characters. A pale yellow to brownish yellow oil; odour, fishy but not rancid; taste, bland or fishy.

Slightly soluble in *alcohol (90 per cent.)*; miscible with *ether*, with *chloroform*, and with *light petroleum (boiling-point 50° to 60°).*

Tests for Identity. A solution of one drop of oil in 1 millilitre of *chloroform*, when shaken with one drop of *sulphuric acid*, acquires a light violet colour, changing to purple and finally brown or blue.

Tests for Purity. *Specific gravity* (15·5°/15·5°), 0·900 to 0·918; *refractive index* at 40°, 1·459 to 1·466; *acid value*, not greater than 2; *saponification value*, not greater than 200; *unsaponifiable matter*, not more than 2 per cent; *iodine value*, not less than 90.

Transfer 5 millilitres of oil to a centrifuge tube and add 5 millilitres of *benzene*; centrifuge for 25 minutes at 25°; no precipitate forms and a clear solution remains.

Assay. *For vitamin A activity.* Carry out the *spectro-photometric method of estimation of vitamin A* or the *tintometric method* of *estimation of vitamin A.*

Storage. Shark-Liver Oil should be kept in a well-filled, well-closed glass container preferably coloured and protected from light.

Preparation. Extractum Malti cum Oleo Selachoidei.

DOSES

Metric.	Imperial.
0·2 to 1·0 mil.	3 to 15 minims.

Approximate equivalent doses in Units.

Vitamin A, 1500 to 7500 units.

NOTE. *Diluted Shark-Liver Oil, as available in commerce, should be administered in proportionately higher doses.*

OLEUM SINAPIS EXPRESSUM

[Ol. Sinap. Express.]

Expressed Oil of Mustard

Synonym. Mustard Oil.

Indian names. Bengali—*Sarishar tel ;* Hindi—*Sarso-ka-tel ;* Marathi—*Mohaki-tela.*

Expressed Oil of Mustard is obtained by pressure from the seeds of *Brassica juncea* Hook f. and Th. or of varieties of these species (Fam. *Cruciferæ*).

Characters. A brownish yellow to golden yellow liquid; odour, characteristic; taste, pungent.

Slightly soluble in *alcohol;* miscible with *ether*, with *chloroform* and with *light petroleum* (*boiling point, 40° to 50°*).

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·9140 to 0·9206; *refractive index* at 40°, 1·4640 to 1·4670; *saponification value*, 168 to 180; *iodine value*, 96 to 110.

Contains not less than 0·4 per cent. natural essential oils.

Shake with an equal volume of *nitric acid*, no brownish red or orange colour develops (limit of argemone oil).

Shake slowly 3 millilitres with 1 millilitre of *glacial acetic acid* and 3 millilitres of 3 per cent. w/v aqueous solution of *cupric acetate*. Heat on a water-bath for about 15 minutes, shake well and allow to stand. No precipitate or change of colour from blue to green in the aqueous layer is produced (limit of argemone oil).

Shake a little with *alcoholic solution of potassium hydroxide*, heat and add a few drops of *solution of ferrous sulphate*, followed by a few drops of *solution of ferric chloride*. Shake well and add *hydrochloric acid*. No prussian blue or greenish blue colour develops (limit of pakra oil).

Complies with the *test for the absence of cottonseed oil, of sesame oil, and of arachis oil.*

Storage. Expressed Oil of Mustard should be stored in well-closed containers.

Pakra Oil is oil from the seeds of *Schleichera trijuga* Linn.

Argemone Oil is oil from the seeds of *Argemone mexicana* Linn.

OLEUM TEREBINTHINÆ

[Ol. Terebinth.]

Oil of Turpentine

Synonyms. Oleum Terebinthinæ Rectificatum: Rectified Oil of Turpentine.

Indian names. Bengali—*Tarpin tel*; Hindi—*Tarpin-ka-tel.*

Oil of Turpentine is the oil distilled from the oleo-resin, turpentine, obtained from *Pinus longifolia* Roxb., *Pinus khasya* Royle, *Pinus excelsa* Wall. (Fam. *Pinaceæ*) and rectified.

Characters. A colourless limpid liquid; odour, characteristic; taste pungent and somewhat bitter.

Soluble in 7 volumes of *alcohol (90 per cent.)* and in all proportions of *alcohol (95 per cent.), ether, chloroform* and *glacial acetic acid.*

Optically active but the rotation is variable.

Tests for Identity and Purity. *Specific gravity* (15·5°/15·5°), 0·860 to 0·870; *refractive index* at 20°, 1·467 to 1·477; *iodine value*, not less than 280 as determined by the following method:—Weigh accurately and rapidly about 0·1 gramme (0·095 to 0·105 gramme) into a glass tube about 12 millimetres long, which has an internal diameter of 5 millimetres, and is sealed and flattened at one end; drop this tube and its contents into a previously dried stoppered vessel, containing 10 millilitres of *carbon tetrachloride*, and 30 millilitres of *solution of iodine monochloride.* Shake thoroughly, and set aside in a dark place at 15° to 20° for exactly one hour, add 15 millilitres of *solution of potassium iodide*, and proceed as directed for the *determination of the iodine value of fixed oils and fats.* Use 30 millilitres of *solution of iodine monochloride* for the determination without the Oil of Turpentine.

3 drops evaporated from the same spot of an unsized paper, leave no stain (absence of fixed oils).

2 grammes leave, when evaporated rapidly in a flat dish on a water bath, not more than 0·05 gramme of residue.

Storage. Oil of Turpentine should be kept in a well-closed container, protected from light, and stored in a cool place.

Preparation. Linimentum Terebinthinæ.
Linimentum Terebinthinæ Aceticum.

DOSES

Metric.	Imperial.
0·2 to 0·6 mil.	3 to 10 minims.

Anthelmintic doses.

8 to 16 mils.	120 to 240 minims.

OLEUM VEGETABILUM HYDROGENATUM

[Ol. Vegetab. Hydrogenat.]

Hydrogenated Vegetable Oil

Hydrogenated Vegetable Oil is obtained, by hydrogenating, under appropriate conditions a suitable vegetable oil, preferably groundnut

oil or cotton-seed oil. The non-grainy variety should be used for pharmaceutical purposes.

Characters. Almost white, soft solid, melting to a colourless or pale yellow translucent liquid between 30° to 42°. Odour, none or faintly nutlike; taste, bland.

Tests for Purity. *Melting point*, not more than 42°; *acid value*, not more than 0·2; *butyrorefractometer reading* at 40°, 48 to 52; *Polenske value*, not more than 0·3; *iodine value*, 45 to 65; *saponification value*, 188 to 195; *Kirschner value*, 0; *Reichert-Meissl value*, not more than 0·5.

NOTE. *Intended for external use.*

PAPAINUM

[Papain.]

Papain

Papain is a proteolytic enzyme or a mixture of several enzymes obtained by adding alcohol to the freshly drawn juice of the unripe fruit and other parts of *Carica papaya* Linn. (Fam. *Caricaceæ*). The residue is dissolved in water and reprecipitated with alcohol and dried.

The amino-acids produced by 1 gramme of Papain by the assay process require for neutralisation not less than 25 millilitres of N/10 sodium hydroxide.

Characters. White to light brown, amorphous, slightly granular powder; nearly odourless; taste, slightly acid or saline.

Tests for Purity. *Ash*, not more than 1 per cent.

Assay. Prepare a 4 per cent. solution of *gelatine* and adjust the pH of this solution to 5·0 by the addition of a few millilitres of *N/10 sodium hydroxide*. To 50 millilitres of this solution add 10 millilitres of *citrate buffer* of pH 5·0. Triturate 1 gramme of the sample, accurately weighed, with a few millilitres of *water* and make up the suspension to 20 millilitres after adjusting to pH 5·0. Add 10 millilitres of this suspension to the gelatine buffer solution. Withdraw immediately 25 millilitres from this mixture and add 20 millilitres of *solution of formaldehyde* freshly neutralised to *solution of phenolphthalein* with *N/10 sodium hydroxide*. Titrate against *N/10 sodium hydroxide* using *solution of phenolphthalein* as indicator. Incubate the remainder of the mixture at a temperature of 55° for a period of 3 hours. Withdraw 25 millilitres of the mixture and add 20 millilitres of *solution of formaldehyde* previously neutralised to *solution of phenolphthalein*. Titrate against *N/10 sodium hydroxide* to the same end point as in the previous titration. Calculate from the difference in the two titrations the number of millilitres of *N/10 sodium hydroxide* neutralised by amino acids formed by 1 gramme of Papain.

Storage. Papain should be preserved in dry securely closed containers.

Preparation. Glycerinum Papaini.

DOSES

Metric.	Imperial.
12 to 0·6 gramme.	2 to 10 grains.

PECTINUM

[Pect.]

Pectin

Pectin is a purified carbohydrate product obtained from the dilute acid extract of the inner portion of the rind of citrus fruits.

Pectin yields not less than 7 per cent. of methoxyl groups and not less than 78 per cent. of galacturonic acid based on a total ash and moisture-free basis.

Characters. Coarse or fine powder. Almost odourless; taste, mucilaginous. Insoluble in *alcohol (90 per cent.)*, in dilute alcohol, and in other organic solvents.

Almost entirely soluble in 20 parts of *water* at 25°, forming a viscous opalescent colloidal solution which flows readily.

An aqueous solution is acid to *blue litmus paper.*

Tests for Identity. Heat 1 gramme with 9 millilitres of *water* on a water bath until a solution is formed, replacing the water lost by evaporation. It yields a stiff gel upon cooling.

Tests for Purity. A 1 per cent. w/v solution yields a translucent gelatinous precipitate when treated with an equal volume of *alcohol (90 per cent.)* (difference from gums).

Boil a 2 per cent. aqueous solution, cool, and add a few drops of a *solution of iodine.* No blue colour is produced (absence of starch).

Place 1 gramme into a 500 millilitre flask, wet it with 3 to 5 millilitres of *alcohol (90 per cent.)*, pour in rapidly 100 millilitres of *water*, shake well, and allow to stand until solution is complete. To this solution add 100 millilitres of *alcohol (90 per cent.)*, containing 0·3 millilitre of *hydrochloric acid*, mix thoroughly and filter rapidly. Measure 25 millilitres of the filtrate into a tared **dish,** evaporate the liquid on a steam bath and dry the residue in a vacuum oven at 50° for two hours. The weight of the residue should not exceed 20 milligrammes (sugars and organic acids).

Heat 50 millilitres of a 2 per cent. w/v aqueous solution to 70°, add 5 millilitres of a 20 per cent. w/v *solution of sodium hydroxide*, allow to stand 10 minutes in a stoppered flask, acidify slightly with *sulphuric acid* and distil until 5 millilitres of distillate are collected. To this distillate add 1 drop of a 5 per cent. w/v solution of *phosphoric acid* and 1 drop of 5 per cent. w/v aqueous solution of *potassium permanganate.* Mix, allow to stand 1 minute, and add a 5 per cent. w/v aqueous solution of *sodium bisulphite* drop by drop until the colour of the permanganate is discharged. If a brown colour remains add 1 drop of the phosphoric acid solution. To the colourless solution add 5 millilitres of a freshly prepared *solution of chromotropic acid* and heat in a water bath for 10 minutes at 60°. No violet colour is produced (absence of methyl alcohol).

Arsenic limit, 0·2 parts per million.

Ash, not more than 4 per cent.; *acid insoluble ash,* not more than 0·4 per cent.

Loses, on drying at 100° for two hours, not more than 10 per cent. of its weight.

Assay. *For methoxyl groups.* Moisten about 0·5 gramme, accurately weighed, with 1 to 3 millilitres of *alcohol* (*90 per cent.*) and dissolve it in about 100 millilitres of *water*, neutralise with *N/2 solution of sodium hydroxide* using *solution of phenolphthalein* as indicator, and then add exactly 20 millilitres of *N/2 solution of sodium hydroxide* in excess. Shake and let stand for about 15 minutes at room temperature. Add exactly 20 millilitres of *N/2 hydrochloric acid*, shake until colourless, and titrate with *N/2 solution of sodium hydroxide* to a permanent pink colour. Each millilitre of *N/2 solution* of sodium hydroxide used in the latter titration is equivalent to 0·01552 gramme of methoxyl groups. Calculate the percentage with reference to the weight of ash free and moisture free basis of Pectin.

For galacturonic acid. Take about 0·25 gramme, accurately weighed into a 200 millilitre round bottom flask and add 50 millilitres of 12·5 per cent. w/v *solution of hydrochloric acid.* Connect the flask with a vertical condenser, conduct a current of air, free from carbon dioxide, into the flask, connect to the exit end of the vertical condenser an absorption train consisting of four gas washing bottles, the first containing a suspension of silver sulphate, the others containing 50 millilitres each of N/10 *solution of barium hydroxide.* Heat the flask for 4 hours in a glycerol bath at 140°. Let the barium carbonate in wash bottles settle, pipette off 25 millilitres clear solution from each bottle and titrate with *N/10 hydrochloric acid* using *solution of phenolphthalein* as indicator. Carry out a blank determination, omitting the Pectin. Calculate the total net volume of barium hydroxide consumed. Subtract the number of millilitres of *N/10 hydrochloric acid* used in the blank from the number of millilitres consumed in the determination using the Pectin. Each millilitre of the N/10 *barium hydroxide* used by the carbon dioxide liberated from the Pectin is equivalent to 0·009707 gramme of $C_5H_9O_5COOH$ (galacturonic acid). Calculate the percentage with reference to the weight of ash free and moisture free basis of Pectin.

Storage. Pectin should be stored in air-tight containers.

PERPOLITIONES ORYZÆ

[Perpol. Oryz.]

Rice Polishings

Synonym. Rice Bran.

Indian names. Bengali—Chaler-kura.

Rice Polishings consist of the fine flaky pericarp and seedcoat fragments, the embryo, aleurone layer, and outer adhering cells of the starchy endosperm of the grain of *Oryza sativa* Linn. (Fam. *Gramineæ*), suitably defatted. The grains must not have been subjected to the action of boiling water.

Each gramme contains the equivalent of not less than 15 microgrammes of aneurine hydrochloride and 200 microgrammes of nicotinic acid.

Rice Polishings contain not more than 40 per cent. of starch and not more than 10 per cent. of rice hull or other foreign matter.

Characters. A fine flaky yellowish white to pale orange powder; microscopically, numerous scale-like fragments of the pericarp consisting of the epicarp with transversely elongated cells having deeply sinuous end walls, the

mesocarp of transversely elongated cells, the cross cell layer of vermiform cells, all pressed together and traversed by elongated tube cells; fragments of the seedcoat and perisperm of delicate transversely elongated cells arranged in parallel rows, the former staining yellow, the latter blue with *chlor-zinc iodine*; fragments of the aleurone layer of rectangular to polygonal shaped cells containing protein granules and oil globules; fragments of the embryo with small, thin-walled, rectangular and polygonal cells containing protein granules and oil globules; fragments of starchy endosperm of polygonal to radially elongated parenchyma cells containing starch grains; numerous starch grains simple and in oval or spheroidal aggregates, the individual grains up to 10 microns in diameter; occasional irregular fragments of the hull of pale orange colour which, when heated in a 1 per cent. solution of *sodium hydroxide* and mounted, exhibit rows of large, sinuous, thick-walled, siliceous outer epidermal cells of the palet with or without tooth-like projections, sometimes interspersed with short unicellular hairs on their bases. Odour, characteristic and not rancid; taste, sweet.

Tests for Purity. Add about 5 grammes, accurately weighed, to 50 millilitres of cold *water* and stir frequently for 1 hour. Filter through a smooth filter paper and wash the residue with 250 millilitres of cold *water*. Transfer the residue to a 500 millilitres flask, add 200 millilitres of *water* and 20 millilitres of *dilute hydrochloric acid* (*specific gravity 1·125*) and heat on a water bath under a reflux condenser for 2½ hours. Cool the mixture, nearly neutralise with *solution of sodium hydroxide*, add *water* to make exactly 250 milliliters, and filter. Place 50 millilitres of a *solution of potassio-cupric tartrate* in a 400 millilitre beaker and heat to boiling. Add exactly 25 millilitres of the above filtrate, and boil for exactly 2 minutes, keeping the beaker covered. At once collect the cuprous oxide thus formed on a mat of asbestos in a perforated, tared crucible and wash thoroughly with hot distilled water, then with 10 millilitres of *alcohol* (*95 per cent.*) and finally with 10 millilitres of *ether*. Dry for 30 minutes at 100°, cool in a desiccator and weigh. The weight of the cuprous oxide does not exceed 0·240 grammes.

Assay. *For aneurine hydrochloride.* Carry out the *method of thiochrome assay for aneurine hydrochloride* or the method of *biological assay for Vitamin* B_1.

For nicotinic acid. Carry out the *chemical method of estimation of nicotinic acid*, or the *microbiological assay of nicotinic acid.*

Storage. Rice Polishings should be stored in dry well-closed containers.

Preparation. Extractum Perpolitionum Oryzæ.

PHENOTHIAZINA

[Phenothiaz.]

Phenothiazine

$C_{12}H_9NS$ Mol. Wt. 199. 26

Synonym. Thiodiphenylamine.

Phenothiazine may be prepared by heating diphenylamine and sulphur together, in the presence of a small amount of iodine as a catalyst, at a temperature of about 180°.

Phenothiazine, when dried to constant weight at 100°, contains not less than 95 per cent. of $C_{12}H_9NS$.

H

Characters. Weak yellow-green to weak olive-green powder, colour slowly darkens on long exposure to air.

Insoluble in *water*, and incompletely soluble in *ether*. At 25°, one gramme is soluble in about 75 millilitres of *alcohol* (*95 per cent.*), in about 5 millilitres of *acetone*, and in about 45 millilitres of *toluene*.

Tests for Identity. To 10 millilitres of a 0·05 per cent. alcoholic solution, add one drop of a *solution of ferric chloride*; a green solution is produced. Add 1 millilitre of *hydrochloric acid* to 100 millilitres of *water*, heat to 80° and add 5 millilitres of a *solution of hydrogen peroxide*. Slowly add 20 millilitres of a 1 per cent. alcoholic solution of Phenothiazine to the well-stirred aqueous solution maintaining the temperature at 80°; a deep red solution is produced due to the oxidation of Phenothiazine.

Tests for Purity. *Melting point*, 181° to 185°.

Loses, when dried to constant weight at 100°, not more than 0·5 per cent. in weight.

Ash, not more than 0·2 per cent.

Assay. Dissolve 0·1 gramme, dried to constant weight at 100° and accurately weighed, in exactly 200 millilitres of *alcohol* (*95 per cent.*). To 5 millilitres of this solution in a 100 millilitre volumetric flask add 45 millilitres of *alcohol* (*95 per cent.*) and heat in a water bath maintained at 60°. Add 5 millilitres of *bromine water*, stopper tightly and continue heating at 60° for 15 minutes. Add 5 millilitres more of *bromine water*, and allow to stand outside the bath in the stoppered flask for 10 minutes. Remove the excess bromine by boiling the solution for a few minutes. Cool to room temperature and dilute to 100 millilitres with *alcohol* (*95 per cent.*). Determine the Phenothiazine present by colorimetric comparison with a standard solution, as directed above, prepared from Phenothiazine which melts between 184° and 185°.

Storage. Phenothiazine should be stored in well-closed containers.

DOSES

	Metric.	Imperial.
Horses and Mules	30 to 50 grammes.	450 to 750 grains.
Cattle	50 to 80 grammes.	750 to 1,200 grains.
Calves	24 to 40 grammes.	360 to 600 grains.
Swine	5 to 30 grammes	75 to 450 grains.
Sheep and Goats	20 to 25 grammes.	300 to 375 grains.
Lambs (up to 60 lbs.)	10 to 15 grammes.	150 to 225 grains.
Chicken	0·4 to 0·5 grammes.	6 to 8 grains.

NOTE. *Animals should be treated with Phenothiazine only under the advice of a veterinarian.*

PICRORHIZA

[Picrorh.]

Picrorhiza

Indian names. Bengali—*Katki*; Gujerathi—*Kadu*; Hindi—*Kutki*; Marathi—*Kutaki*; Punjabi—*Kalikutki*; Sanskrit—*Katuka*; Tamil—*Katuku-rogani*; Telegu—*Katuku-roni*.

Picrorhiza is the dried rhizome of *Picrorhiza kurrooa* Royle ex Benth., (Fam. *Scrophulariaceæ*) cut in small pieces and freed from attached rootlets.

It contains not more than 2 per cent. of stems and other organic matter.

Characters. Greyish-brown, light, often cylindrical, straight or slightly curved, 2 to 5 centimetres long, 4 to 8 millimetres wide, often with remains of aerial stem which is very dark brown and wrinkled longitudinally; upper and lower surfaces bear few small root scars; numerous semi-amplexicaul scale leaves and thin scars.

In transverse section, cork, pale grey, made of thin cells 10 to 14 layers thick; cortex, dark, lacunous, composed of thin walled parenchyma, plenty of intercellular space; hypodermis, undifferentiated; endodermis, distinct of one layer. Vascular bundles, 4 to 7, reniform, tangentially flattened, pale coloured, arranged in the form of a ring; phloem, a uniform cap of compressed cells full of reserve materials; xylem, spiral vessels, often mixed with annular thickening, and a few xylem parenchyma. Pith, large, lacunous, dark coloured, composed of thin-walled parenchyma. Cambium, not distinct. Odour, slightly unpleasant; taste, very bitter.

Preparations. Extractum Picrorhizæ Liquidum.
Tinctura Picrorhizæ Composita.

DOSES

Metric.	Imperial.
0·6 to 1·2 grammes.	10 to 20 grains.

Antiperiodic Dose

3 to 4 grammes.	45 to 60 grains.

PIX LIQUIDA

[Pix. Liq.]

Tar

Synonym. Chir Tar.

Tar is a bituminous liquid, obtained from the wood of various trees of the Family *Pinaceæ*, chiefly *Pinus longifolia* Roxb., by destructive distillation, and is known in commerce as Chir Tar.

Characters. Dark brown semi-liquid substance; heavier than water. Odour, strong, empyreumatic; taste, bitter, pungent and empyreumatic.

Almost insoluble in water; partly soluble in *alcohol (90 per cent.)*; more soluble in *dehydrated alcohol*, in *ether*, in *chloroform*, in fixed and volatile oils, in *glacial acetic acid* and in dilute solutions of alkali hydroxides.

Tests for Identity. Shake 1 gramme for five minutes with 20 millilitres of water:

The aqueous liquid is neutral to *solution of litmus.*

To 5 millilitres of the aqueous liquid, filtered, if necessary, add 3 drops of a 0·1 per cent. w/v aqueous *solution of ferric chloride*; no red colour is produced.

Tests for Purity. *Specific gravity* (15·5°/15·5°), about 1·07; *ash*, about 0·47 per cent.

Storage. Tar should be stored in well-closed containers.

PLASMA HUMANUM NORMALE CITRATUM

[Plas. Human. Norm. Cit.]

Citrated Normal Human Plasma

CAUTION—*In any part of India in which Plasma Humanum Normale Citratum is controlled by law, care must be taken that the provisions of such law are duly complied with.* (*See page ix*).

Citrated Normal Human Plasma is the sterile plasma obtained by pooling approximately equal amounts of the liquid portion of citrated whole blood from 18 to 20 healthy individuals. Each bleeding is drawn under aseptic precautions into individual sterile centrifuge bottles already containing 100 millilitres of a sterile 3 per cent. w/v solution of chemically pure sodium citrate in Water for Injection for each 500 millilitres of whole blood. The cell-free plasma is separated by centrifugation and stored at 4° to 6° for not less than 72 hours and not more than 120 hours. At the end of this period, the clear supernatant plasma is pooled, usually in 2 or 3 litre pools, all groups being mixed. The following conditions have to be satisfied before the plasma is considered suitable for pooling :—

(*a*) No blood will be used when it has been exposed to a temperature exceeding 37·8°.

(*b*) No blood will be used which has been stored at a temperature exceeding 10·0° for a period exceeding 5 hours.

(*c*) The zone of hæmolysis should not be greater than 1 per cent.

The pooled plasma is sterilised by filtration and distributed into final containers through a closed system. Sterility tests are made, one at the beginning, the other at the middle and the third at the end of filtration.

Citrated Normal Human Plasma may be dispensed as liquid plasma or dried plasma. Before issue individual bottles will be checked in the same way as in Normal Human Serum.

Characters. (*a*) *Liquid Plasma.* Freshly collected Citrated Normal Human Plasma is a slightly opalescent liquid of a faint yellowish or amber colour and practically odourless. It contains no visible particles and is free from cellular elements save for a variable number of blood platelets. Increased opalescence or a precipitate of fibrin may develop on standing. As a stabilizing agent, not more than 10 per cent. of *dextrose* may be added.

(*b*) *Dried Plasma.* This is made from liquid Citrated Normal Human Plasma in the same way as dried Normal Human Serum.

Tests for Purity. Complies with the tests for *Absence of Undue Toxicity* (Protein Hydrolysate, etc.) and with the *sterility tests.*

Regulations. The label on the bottle must bear the name Citrated Human Plasma and agree in all other respects with the regulations under Normal Human Serum.

Storage. Same as in Normal Human Serum.

DOSES

By intravenous injection.

Metric.	Imperial.
500 mils.	20 fluid ounces

PLUMBI ACETAS

[Plumb. Acet.]

Lead Acetate

Synonym. Sugar of Lead.

$(CH_3COO)_2 Pb . 3H_2O$ . . . . Mol. Wt. 379·3

Lead Acetate may be obtained by the interaction of lead oxide and acetic acid. It contains not less than 98 per cent. of $C_4H_6O_4 Pb . 3H_2O$ and not more than 1·7 per cent. of Lead Carbonate, and not more than 0·05 per cent. of insoluble residue.

Characters. Small, white, transparent, monoclinic prisms, or heavy crystalline masses; odour, acetous; taste, sweet and astringent. Effloresces in warm air. Becomes basic when heated.

Soluble in 5 parts of *water*, the resulting solution being not more than slightly turbid, and in 30 parts of *alcohol* (90 per cent.); freely soluble in *glycerin*.

Tests for Identity. Yields the reactions characteristic of lead and of acetates.

Tests for Purity. 1 gramme dissolved in 10 millilitres of recently boiled and cooled *water*, yields a solution which is, at most, faintly opalescent and becomes clear on the addition of a few drops of acetic acid.

1 gramme complies with the *limit test for chlorides*.

Dissolve 0·1 gramme in 15 millilitres of *water*, add 5 millilitres of *dilute solution of ammonium acetate*, 2 millilitres of *acetic acid*, 3 drops of *pyridine*, 1 millilitre of 57 per cent. w/v aqueous solution of *ammonium thiocyanate* and 2 millilitres of *chloroform*; shake vigorously and allow to separate. Any colour produced in the chloroformic layer should not be greater than that produced by treating 1 millilitre of *standard copper solution* in 15 millilitres of *water* in exactly the same way by the same quantities of reagents (limit of copper).

Dissolve 0·1 gramme in 5 millilitres of *water*; add 3 millilitres of *dilute sulphuric acid* and filter; to 4 millilitres of the filtrate add 5 millilitres of *water*, 1 millilitre of *dilute hydrochloric acid* and one drop of *N/10 potassium permanganate*; mix, add 5 millilitres of 57 per cent. w/v aqueous solution of *ammonium thiocyanate* and 10 millilitres of a mixture of equal volumes of *amyl alcohol* and *amyl acetate*, shake vigorously and allow to separate. Any colour produced in the upper layer should not be greater than that produced by treating 0·25 millilitre of *standard solution of iron* in exactly the same way by the same quantities of reagents (limit of iron).

Assay. Dissolve about 10 grammes, weighed accurately, in about 50 to 60 millilitres of recently boiled and cooled *water*. Filter the solution quantitatively through a gravimetric filter paper and wash the residue on the filter with *water* till free from soluble lead salts. The combined filtrate (A) must be collected quantitatively and is used for determination of soluble lead salts.

The insoluble residue on the filter paper is dissolved out with hot *dilute acetic acid* and the filtrate (B) collected quantitatively in a beaker. The filter paper is washed with water till free from all soluble salts, and washings combined with filtrate (B). It is then dried, ignited and weighed. The weight so obtained minus the weight of the filter paper gives the weight of insoluble matter (limit of insoluble residue).

Transfer exactly 25 millilitres of the filtrate (B) to a 200 millilitre volumetric flask, dilute with 50 millilitres of *water*, heat to boiling, and add exactly 50 millilitres of *N/10 potassium dichromate*. Heat on a steam bath, with frequent shaking, for 10 minutes, then cool, dilute with *water* to 200 millilitres, mix well, and allow the precipitate to settle. Filter the mixture through a filter that has not been previously moistened, rejecting the first 20 millilitres of the filtrate, and transfer exactly 100 millilitres of the subsequent filtrate to a glass-stoppered flask. Then add 10 millilitres of *dilute sulphuric acid* and 1 gramme of *potassium iodide*, mix thoroughly, allow to stand for 10 minutes and titrate the liberated iodine with *N/10 sodium thiosulphate*, adding 2 millilitres of *mucilage of* starch near the end of the titration. Each millilitre of *N/10 potassium dichromate* is equivalent to 0·009035 gramme of lead carbonate.

Take an aliquot portion, about 25 to 50 millilitres, accurately measured, of the filtrate (A) representing about 0·4 gramme and transfer to a 20 millilitre volumetric flask, dilute with 50 millilitres of *water*, heat to boiling, and add exactly 50 millilitres of *N/10 potassium dichromate*. Complete the assay as in the preceding paragraph beginning with the words "Heat on a steam bath........near the end of the filtration." Each millilitre of *N/10 potassium dichromate* is equivalent 0·01284 gramme of $(CH_3COO)_2$. Pb. $3H_20$.

Storage. Lead Acetate should be stored in air tight containers.

Preparations. Liquor Plumbi Subacetatis Dilutus.
Liquor Plumbi Subacetatis Fortis.
Suppositorium Plumbi cum Opio.

DOSES

Metric.	Imperial.
0·03 to 0·12 gramme.	½ to 2 grains.

PSORALEÆ SEMINA

[Psoral. Sem.]

Psoralea Seeds.

Indian names. Bengali—*Latakasturi*; Gujerathi—*Bavachi*; Hindi—*Babchi*; Marathi—*Babchi*; Oriya—*Vakuchi*; Punjabi—*Babchi*; Sanskrit—*Sugandha kantak*; Tamil—*Karpo karishi*; Telegu—*Kala giuja*.

Psoralea seeds consist of the entire seeds of *Psoralea corylifolia* Linn. (Fam. *Leguminosæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Seeds, really fruits with pericarp adhering to the seed coat, 3·5 to 4·5 millimetres long, 2 to 3 millimetres wide. Pods, one seeded, ovoid-oblong, somewhat compressed, glabrous, mucronate, closely pitted, giving the apprearance of a bathsponge under a magnifying lens. Colour, dark chocolate to almost black. Cotyledons do not contain any starch, Odourless, but when chewed smell of a pungent essential oil is felt; taste, bitter, unpleasant and acrid.

Preparation. Linimentum Psoraleæ.

PULVIS CATECHU NIGRI COMPOSITUS

[Pulv. Cat. Nig. Co.]

Compound Powder of Black Catechu

Black Catechu, *finely powdered*	50 grammes.
Kino, *finely powdered*	25 grammes.
Cinnamon, *finely powdered*	15 grammes.
Nutmeg, *finely powdered*	10 grammes.

Mix.

DOSES

Metric.	Imperial.
0·3 to 0·6 gramme.	5 to 10 grains.

PULVIS KALADANÆ COMPOSITUS

[Pulv. Kalad. Co.]

Compound Powder of Kaladana

Kaladana, in *fine powder*	700 grammes.
Potassium Acid Tartrate, *finely powdered*	700 grammes.
Ginger, *finely powdered*	100 grammes.

Mix.

DOSES

Metric.	Imperial.
4 to 6 grammes.	60 to 90 grains.

PULVIS TURPETHI COMPOSITUS

[Pulv. Turp. Co.]

Compound Powder of Turpeth

Turpethum, in *fine powder*	700 grammes.
Potassium Acid Tartrate, *finely powdered*	700 grammes.
Ginger, *finely powdered*	100 grammes.

Mix.

DOSES

Metric.	Imperial.
4 to 6 grammes.	60 to 90 grains.

PUNARNAVA

[Punarnav.]

Punarnaba

Indian names. Trianthema portulacastrum. Bengali—*Sabuni, Punarnaba* ; Hindi—*Lalsabuni* ; Kanarese—*Muchchu-joni* ; Marathi—*Pundharighentuli* ; Punjabi—*Bishkapra* ; Sanskrit—*Punaravi* ; Tamil—*Sharunnai* ; Telegu—*Galijeru.*

Bœrhaavia repens. Bengali—*Punarnaba* ; Gujerathi—*Moto satodo* ; Hindi—*Sant* ; Marathi—*Vasu* ; Sanskrit—*Shothagni, Punarnava* ; Tamil—*Mukukrattai* ; Telegu—*Atika mamidi.*

Punarnaba consists of the fresh or the dried plant, *Bœrhaavia repens* Linn. (Fam. *Nyctaginaceæ*) or the leaves of the white variety of *Trianthema portulacastrum* Linn. (Fam. *Ficoideæ*). It contains not more than 2 per cent. of other foreign organic matter.

Characters. *Trianthema portulacastrum.* Leaves, subfleshy, obliquely opposite, unequal, upper one of the pair larger, 18 to 27 millimetres long, 18 to 31 millimetres broad, lower one 9 to 12 millimetres long, 6 to 18 millimetres broad, broadly ovate, rounded, often apiculate at the apex, cuneate at the base, glabrous. Petioles, 6 to 12 millimetres long, much dilated and membranous at the base, especially those of the smaller leaves in which the membranous enlargement forms triangular pouch. Microscopically, leaves, more or less isobilateral, epidermal cells on both sides, pentagonal or hexagonal, walls slightly wavy ; stomata, on both sides, in equal numbers ; distinct short conical papillae in one row on the margin ; hairs absent. In transverse section, spongy parenchyma below epidermis ; palisade cells containing the plastids around the central cells surrounding the veinlets. Cystoliths, numerous ; raphides, absent.

Bœrhaavia repens. Stem, greenish purple, stiff, slender, cylindrical, thickened at the nodes, minutely pubescent or nearly glabrous, prostrate, ascending or descending, divaricately branched ; branches, from common stock, often several yards in legnth ; root, large, fusiform ; leaves, unequal pairs in each node, larger 2·5 to 3·7 centimetres long, smaller 12 to 18 millimetres long, ovate, or orbicularly rounded at the apex or slightly pointed, green and glabrous above, thin soft, usually white minute scales beneath the margin ; margin, entire often pinkish ; base, undulate, rounded or subcordate ; petioles, nearly as long as the blade, slender. Flowers very small, shortly stalked or nearly sessile, 4 to 10 together in small umbells, arranged in slender long stalks ; bracteoles, small, acute ; perianth, lower part greenish, upper part pink, 3 millimetres long, margin 5 lobes, tube contracted above the overy ; stamens, 2 to 3 ; fruit, one-seeded nut, 6 millimetres long, clavate, 5-ribbed, viscidly glandular. Microscopically, stem, anthocyanin pigmentation in collenchymatous hypodermal tissue, pericycle sclerenchymatous ; leaves, upper epidermal cells walls slightly wavy, lower ones more so ; stomata, on both sides, numerous, Short hairs, 3 to 4 celled, few, present on the margin. In transverse section epidermal cells on both sides equal ; palisade cells arranged in regular rows ; mesophyll cells, of special type, surrounding the veinlets containing deep green pigments ; spongy cells, 2 to 3 layers thick, having mostly small air spaces, large elongated cells containing bundles raphides ; orange-red resinous fragments and occasional cluster crystals in mesophyll cells. Palisade ratio, 5·5 to 6·5.

Preparation. Extractum Punarnavæ Liquidum.

PYRETHRUM

[Pyreth.]

Pyrethrum

Pyrethrum consists of the dried, closed, half open, or open flower of *Chrysanthemum cinerariifolium* Vis (Fam. *Compositæ*), and contains not more than 5 per cent. of naturally adhering stems.

Pyrethrum contains not less than 0·4 per cent. of pyrethrin I and pyrethrin II.

Characters. Flowerhead, hemispherical, often flat, 10 to 15 millimetres in diameter excluding the ray florets; closed flower heads, smaller in size; receptacle, convex, destitute of palaeae, 5 to 8 millilitres in diameter; peduncle, short, longitudinally striated; involucre, 3 rows of yellowish green bracts; outer bracts, lanceolate, keel pronounced; inner bracts, spatulate, longer, margin white and membranous specially near the tip. Ray florets, 15 to 23, all female. Corrolla, cream or straw coloured, ligulate, oblong, shrivelled, 15 to 20 millilitres long, 15 to 17 veined, 3 small rounded teeth at the apex, central one smallest. Disc floret, 200 to 300, hermaphrodite, each having a yellow tubular corolla with 5 short lobes at the summit. Style arms of all florets, truncate, difid, Floret cypsela, inferior, 5-ribbed, oblong, about ·5 millimetres long, surrounded by a membranous tubular calyx about 1 millimetre long. Microscopically, parenchyma of the receptacle, pitted, thickwalled; hairs on the bracts, peculiar T-shaped, consisting of two-celled base and 1-celled summit which is long and tapering at both ends. Ligulate corolla, two folded, separable, outer epidermal cells oblong and papillate, lower epidermal cell wall wavy. Pollen grains, numerous surface spiny, 25 to 30 microns in diameter, 3-lobed corresponding to 3 pores, cells of seed-coat, strongly lignified. Ovarian wall, sessile glandular hairs, small prisms of calcium oxalate, brownish resin canals. Odour characteristic; taste, bitter, followed by slight numbing sensation.

Pyrethrum, in powder, light yellowish brown; microscopically, large number of characteristic pollen grains, fragments of involucral scales composed of sclerenchyma, bits of stem containing collenchyma, fragments of corolla with papillate epidermis, rectangular patches of sclerenchyma of the achenal wall, T-shaped hairs, etc.

Test for Purity. *Ash*, not more than 8 per cent.; *acid-insoluble ash*, not more than 1 per cent.

Assay. *For Pyrethrin I.* Weigh 10 grammes of Pyrethrum powder and transfer to a Soxhlet. Cover the powder with *light petroleum (boiling point, 40° to 60°)* and allow to stand overnight. Carry out the extraction for six hours at the end of which transfer the extract to a conical flask and remove the solvent. Add 20 millilitres of a *N/2 solution of potassium hydroxide* in *ethyleneglycolmono-ethyl ether* or in *alcohol (90 per cent.)* and boil the mixture for 20 minutes. If alcoholic potash is used for saponification the mixture must be boiled for 90 minutes. After cooling, wash the contents of the conical flask in a graduated flask, add 10 millilitres of a 1·0 per cent. w/v aqueous *solution of barium chloride* and make the volume up to 250 millilitres with distilled water. Shake and allow the precipitate to settle, filter. Acidify 200 millilitres of the filtrate with dilute sulphuric acid adding 1 millilitre in excess. Distil with steam till the volume is reduced to about 50 millilitres. Extract the distillate, measuring 300 to 350 millilitres, three times with *light petroleum (boiling point, 40° to 60°)*. Combine the petroleum ether extracts and wash successively with two 10 millilitre portions of water. Transfer the petroleum ether extract to a stoppered

bottle, add 15 millilitre of *water* and titrate to phenolophthalein with *N/50 sodium hydroxide*. Each millilitre of *N/50 sodium hydroxide* is equivalent to 0·0066 gramme of Pyrethrin I.

For Pyrethrin II. The contents of the flask after steam distillation are filtered and made alkaline with *sodium bicarbonate* to *methyl orange*. The solution is extracted twice with 20 millilitres of *chloroform* washing each extract with 10 millilitres of *water*. The washings are added to the original solution. Add 8 millilitres of *hydrochloric acid*, saturate the solution with *sodium chloride*, and extract three times with 60 millilitre portions of water. Transfer the combined extracts to a 300 millilitre conical flask and remove the solvent. Dry the residue for 10 minutes on the water-bath, pass a rapid current of air through the flask for 10 to 15 seconds to remove volatile impurities. Add 2 millilitres of *neutralised alcohol*, warm and add 20 millilitres of *water*. Heat on a water-bath for a few minutes and titrate to phenolphthalein with *N/50 sodium hydroxide*. One mililitre of *N/50 sodium hydroxide* is equivalent to 0·00372 gramme of Pyrethrin II.

Storage. Pyrethrum flower should be stored in closed well-filled containers and should not be kept for more than two years.

Preparation. Solutio Pyrethri.

NOTE. *Intended for use as an insecticide.*

QUASSIA

[Quass.]

Quassia

Synonym. Quassia Wood.

Indian names. Bengali—*Bhurungi* ; Hindi—*Bhurangi* ; Punjabi—*Tithu*.

Quassia is the stem-wood of *Picræna quassioides* Benth. (Fam. *Simarubaceæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Chips or raspings, occasionally logs; yellowish-white or bright yellow, light and tough but easily split; composed mainly of vessels with small bordered pits, of long wood-fibres with moderately thick walls; wood parenchyma absent; pith, very small; medullary rays, prominent; calcium oxalate crystals, absent; starch grains, few. Odour, none; taste, intensely bitter.

Preparations. Infusum Quassiæ Concentratum.
Tinctura Quassiæ.

DOSES

Metric.	Imperial.
0·12 to 0·5 gramme.	2 to 8 grains.

QUININÆ SULPHAS DIHYDRATUM

[Quinin. Sulph. Dihydr.]

Dihydrated Quinine Sulphate

$(C_{20}H_{24}O_2N_2)_2 . H_2SO_4 . 2H_2O$ . . Mol. Wt. 782·92

Dihydrated Quinine Sulphate is the sulphate of an alkaloid, quinine obtained from the bark of various species of *Cinchona*, and contains two molecules of water of crystallisation.

Characters. White, fine, lustreless, needle-like crystals, light and readily compressible. Odourless; taste, bitter and persistent. On exposure to light, it may acquire a brown tint.

Sparingly soluble in *water* (1 in 800) and in *alcohol* (*95 per cent.*) (1 in 120) at 25°. Slightly soluble in *chloroform* and in *ether*, but freely soluble in a mixture of 2 volumes of *chloroform* and 1 volume of *dehydrated alcohol*.

A saturated aqueous solution is neutral or very slightly alkaline to *red litmus paper*.

Tests for Identity. On acidifying an aqueous solution with *dilute sulphuric acid*, the solution develops a vivid blue fluorescence. Add to an aqueous solution 1 or 2 drops of *solution of bromine* and 1 millilitre of *dilute solution of ammonia*. The liquid acquires an emerald green colour due to the formation of thalleioquin.

A 2 per cent. w/v aqueous solution made with a few drops of *hydrochloric acid* gives the *reactions* characteristic of sulphates.

A 2 per cent. w/v aqueous solution in *N/1 sulphuric acid* is lævorotatory.

Tests for Purity. Loses, when dried at 100°, not more than 5 per cent. of its weight.

Leaves, on incineration, not more than 0·05 per cent. of ash. Heat 1 gramme with 7 millilitres of a mixture of 2 volumes of *chloroform* and 1 volume of *dehydrated alcohol* to 50°. It dissolves completely and the solution remains clear on cooling (limit of inorganic salts).

Dry the material taken for test at 50° for 2 hours and then agitate 1·8 grammes of the dried salt with 20 millilitres of *water* to 65° for 30 minutes. Cool the mixture to 15°, allow to stand at this temperature for 2 hours with very frequent shaking and then filter through a filter paper (8 to 10 centimetres in diameter). Transfer 5 millilitres of the filtrate, at a temperature of 15°, to a test tube, and mix gently, without shaking, with 6 millilitres of a solution of ammonia, which must contain not less than 10 per cent. w/w, and not more than 10·2 per cent. w/w of NH_3. The temperature must be maintained at 15° and all the solution must be added at once. A clear liquid is produced (limit of other cinchona alkaloids).

Storage. Dihydrated Quinine Sulphate should be stored in a well-closed container, and protected from light.

DOSES

Metric.	Imperial.
0·06 to 0·6 gramme.	1 to 10 grains.

QUINIODOCHLORUM

[Quiniod.]

Quiniodochlor

$C_9H_4N.OH.I.Cl$ . . . . . Mol. Wt., 269·42

Quiniodochlor is 5-chloro-7 iodo-8 hydroxy quinoline and may be obtained by iodination of 5-chloro-8-hydroxy quinoline and repeatedly crystallising the product from hot glacial acetic acid.

It contains not less than 37·5 per cent. and not more than 41·5 per cent. of iodine ; not less than 11·5 per cent. and more than 12·2 per cent. of chlorine.

Characters. Greyish-yellow powder. Odour, faintly aromatic. Almost insoluble in *water*, sparingly soluble in *alcohol (90 per cent)*, soluble in hot *glacial acetic acid*.

Tests for Identity. Boil 0·1 gramme with 5 millilitres of *hydrochloric acid*. It dissolves slowly evolving an odour of iodine.

Drop 0·1 gramme in about 5 millilitres of *sulphuric acid* in a porcelain basin ; copious vapour of iodine is evolved.

Make 5 millilitres of a 1 per cent. w/v aqueous solution slightly acid with *dilute hydrochloric acid*, add 5 millilitres of *chloroform* and one drop of a 10 per cent. w/v aqueous solution of *sodium nitrite*, and shake ; the chloroform is coloured violet.

Tests for Purity. *Melting point*, 178° to 180°.

Assay. *For Iodine.* Mix about 0·5 gramme, accurately weighed, in a nickel crucible with a mixture made of 4 parts of powdered *sodium hydroxide* and 1 part *potassium nitrate* and heat until fusion is complete. Cool, and dissolve the fused mass in 150 millilitre beaker and wash well. Add 50 millilitres of *N/10 silver nitrate* (the amount of silver is k in the formula below) ; then add slowly, with stirring, *nitric acid* until acid in reaction to *blue litmus paper*. Filter the solution through a weighed Gooch crucible, wash and titrate the excess silver nitrate in the filtrate with *N/10 potassium sulphocyanate* (the amount of silver in the filtrate is a). Wash the precipitate in the Gooch crucible with 3 portions of *alcohol (90 per cent.)*, then with *ether*, dry at 100°, and weigh (w). Calculate the amount of iodine according to the formula $x = \frac{0{\cdot}7527w + a - k}{0{\cdot}293}$ where x is the weight of silver iodide and $(w\text{-}x)$ is the weight of silver chloride.

For chlorine. Mix about 0·5 gm. of the sample, accurately weighed, in a nickel crucible with a mixture of powdered sodium hydroxide (4 parts) and potassium nitrate (1 part), and heat until fusion has been completed. Cool and dissolve the fused mass in 150 millilitres of water, warming to hasten solution ; filter into a beaker and wash well. Add 50 millilitres of N/10 silver nitrate, and then add slowly, with stirring, concentrated nitric acid until acid in reaction to litmus paper. Filter the solution through a weighed Gooch crucible, wash with water, with 3 portions of alcohol, then with ether, dry at 100°C and weigh. The difference in weight represents the weight of the total silver halides (W_1).

Silver Iodide + Silver chloride = W_1.

Silver Iodide = W_2 = 0·0185 × percentage of iodine × wt. of substance taken

Silver chloride = $W_1 - W_2$

$$\text{Percentage of chlorine} = \frac{(W_1 - W_2) \times 0{\cdot}2474 \times 100}{\text{Weight of substance taken}}.$$

Storage. Quiniodochlor should be stored in a dry securely closed container.

DOSES

Metric.	Imperial.
0·25 gramme.	4·00 grains.

RAUWOLFIA

[Rauwol.]

Rauwolfia

Indian names. Bengali—*Chandra* ; Hindi—*Chotachand* ; Oriya—*Dhannerna*, *Dhan-barua* ; Sanskrit—*Sarpagandha*, *Chandrika* ; Tamil—*Covannamiloori* ; Telegu—*Patala-agandhi*.

Rauwolfia consists of the dried roots of *Rauwolfia serpentina* Benth. (Fam. *Apocynaceæ*) with the bark intact, collected in autumn from 3 to 4 years old plants. It contains not more than 2 per cent. of other organic matter, and not less than 0·8 per cent. of total alkaloids of Rauwolfia.

Characters. Roots, stout, thick, up to 40 centimetres long, 2 centimetres in diameter, tortuous; surface slightly wrinkled, rough, and coarse longitudial markings; often branched; fracture, short, irregular. Root-bark, greyish-yellow, inside wood, pale and whitish.

In microscopic examination, considerable development of secondary root; pith, absent, vessels small, central region contains larger vessels. Medullary rays in radial rows. Xylem parenchyma, full of starch; phloem, thin, cortical region small; cork cells, radially elongated, stratified. Odourless; taste, very bitter.

Tests for Identity. Put 2 drop of a mixture of 2 parts of *nitric acid* and 1 part of water, on a freshly fractured surface of the root. A pronounced colouration along the medullary rays, particularly along the cortex, is produced.

Assay. Weigh 10 grammes in *No. 40 powder*, into a 500 millilitre stoppered flask and add 200 millilitres of a mixture of 23 volumes of *ether*, 8 volumes of *chloroform* and 2·5 volumes of *alcohol (90 per cent.)*. Stopper the flask, shake well and allow to stand for ten minutes. Add 6 millilitres of *dilute solution of ammonia*, shake the flask frequently for one hour, and allow to stand for eight hours with occasional shaking. Add 10 millilitres of *water*, shake the mixture vigorously and when the drug has settled, draw out 100 millilitres of the solution representing 5 grammes of the drug. Filter through a filter paper into a separator, and wash both the measure and the filter with a few millilitres of a mixture of ether and chloroform. Shake the extract with successive portions of 20, 15, 10, 10 and 10 millilitres of *N/2 sulphuric acid* for *complete extraction* of the alkaloids. Filter the combined acid extracts into a separator through a filter paper wetted with *water*, washing the container and the filter with a few millilitres of *water*. Make the total acid solution alkaline to litmus with *dilute solution of ammonia* and add 5 millilitres more of the *dilute solution of ammonia*. Extract the liberted alkaloids with successive portions of 20, 15, 10 and 10 millilitres of *chloroform*, wash the combined chloroform extracts with 10 millilitres of *water*. Shake the water used for washing with two 5 millilitre portions of *chloroform*. Add the *chloroform* washing to the main chloroform extract and filter the whole into a tared 100 millilitre conical flask through a filter paper wetted with *chloroform*. Wash the container and the filter with 5 millilitres of *chloroform*. Distill off the *chloroform* on a water-bath until only a few millilitres are left and remove the solvent completely in a vacuum desiccator. Add

5 millilitres of *alcohol* (*90 per cent.*) to the residue and again remove the solvent. Repeat the evaporation with *alcohol* (*90 per cent.*), dry the residue to constant weight in a vacuum desiccator and weigh as total alkaloids.

Storage. Rauwolfia should be stored in well-closed containers.

Preparations. Extractum Rauwolfiæ Liquidum.
Extractum Rauwolfiæ Siccum.
Tinctura Rauwolfiæ.

DOSES

Metric.	Imperial.
1 to 2 grammes.	15 to 30 grains.

RHEUM

[Rheum]

Rhubarb

Synonym. Rhei Rhizoma.

Indian names. Bengali, Hindi and Punjabi—*Revand-chini ;* Tamil—*Nattu-irreval-chini ;* Telegu—*Nattu-reval-chini.*

Rhubarb consists of the dried rhizome and roots of *Rheum emodi* Wall., *Rheum webbianum* Royle. (Fam. *Polygonaceæ*) and other species of *Rheum.* It is collected from 6 to 7 years old plants just before the flowering season and marketed with cortex intact or partially decorticated.

Rhubarb contains not more than 2 per cent. of other organic matter.

Characters. Compact, firm, subcylindrical, barrel-shaped, conical or plano-convex pieces mostly of roots, ranging from 2 to 20 centimeters in length and from 1·5 to 8 centimeters in diameter; irregularly longitudinally wrinkled, furrowed or ridged, some pieces showing transverse wrinkles or annulations usually covered with a brownish or yellowish brown cortex, fracture often showing the cambium line. Transverse section shows a brown bark composed of 10 to 12 layers of cells. Cortex consisting of 5 to 6 layers of parenchymatous cells followed by a single layer of rectangular cells. Parenchymatous cells contain abundant starch grains, tannin, large cluster crystals of calcium oxalate and an amorphous yellow substance insoluble in *alcohol* (*90 per cent.*) but soluble in *water.* Vascular bundles arranged in a ring, 2 to 3 layers of cells form the prominent wavy cambium; walls of xylem vessels lignified; star-spots entirely absent in mature rhizomes. Medullary rays 2 to 3 cells wide present in the normal vascular bundles. Odour, fragrant; taste, bitter and astringent.

In powdered form dusky brownish yellow; rosette aggregates of calcium oxalate; starch grains, spheroidal or angular, single and 2 to 4-compound, abundant; spiral tracheae, few, lignified. Medullary ray cells contain an amorphous yellow to brown substance which dissolves in *dilute solution of ammonia* with a pink to red colour.

Tests for Identity. Becomes red upon the addition of alkalies (presence of anthraquinone compounds).

Boil 0·1 gramme of powder with 10 millilitres of an aqueous solution of *potassium hydroxide* (1 in 100), allow to cool, filter, acidulate the filtrate with *hydrochloric acid* and shake with 10 millilitres of *ether ;* the ethereal layer becomes yellow. Shake this ethereal solution with 5 millilitres of *ammonia ;* the latter is coloured red (emodin) and the ethereal layer remains yellow (chrysophanic acid).

Tests for Purity. *Alcohol (49 per cent.) soluble extractive*, not less than 30 per cent. *Acid-insoluble ash*, not more than 1 per cent.

Preparations. Pilula Rhei Composita.
Pulvis Rhei Compositus.
Tinctura Rhei Composita.

DOSES

Metric.	Imperial.
0·2 to 1 gramme.	3 to 15 grains.

SACCHAROMYCES SICCUM

[Saccharomy. Sicc.]

Dried Yeast

Indian names. Hindi and Bengali—*Khami.*

Dried Yeast consists of the dry cells of any suitable strain of *Saccharomyces cerevisiæ* Meyen. (Fam. *Saccharomycetacæ*) or *Torula utilis.* It may be obtained as a by-product in the manufacture of beer by the alcoholic fermentation of an extract of malted cereal grains and hops using a strain of *Saccharomyces cerevisiae.* It may be prepared by growing suitable strains of yeast, e.g., *Saccharomyces cerevisiæ* or *Torula utilis* in media containing molasses, ammonium salts and other mineral salts under strong aeration of the medium. The yeast cells are separated, washed free of the adhering media with ice-cold water, pressed in canvas bags and dried at a temperature not exceeding 100°.

Dried yeast contains not less than 40 per cent. of protein and, in each gramme, the equivalent of not less than 30 microgrammes of aneurine hydrochloride, ($C_{12}H_{17}ON_4SCl.\ HCl.H_2O$), 40 microgrammes of riboflavin ($C_{17}H_{20}N_4O_6$) and 250 microgrammes of nicotinic acid ($C_6H_5O_2N$).

Characters. Yellowish white to pale yellowish orange flakes, granules or powder; containing numerous irregular masses and isolated yeast cells, the latter ovate, elliptical, spheroidal or elliptic-elongate in shape, some with one or more attached buds; up to 12 microns in length and up to 7·5 microns in width; each with a wall of fungus cellulose surrounding a protoplast containing refractile glycogen vacuoles and oil globules; occasional septated hyphal out-growths of Saccharomyces cerevisiae and segments of elongated forms of yeast films. Odour and taste, characteristic.

When examined microscopically it should not contain starch, corn meal, or other filler.

Tests for Identity and Purity. Suspend the Dried Yeast in *sterilised water*, plate on nutrient agar, and incubate at 37·5° for 48 hours; the live-bacteria count shall not exceed 7500 per gramme and the mould count shall not exceed 50 per gramme (limit of bacterial and mould count).

Loses, when dried at 100°, not more than 7 per cent. of its weight.

Leaves, on incineration, not more than 8 per cent. of residue.

Assay. *For protein.* Carry out the *method for estimation of total nitrogen.*

For aneurine hydrochloride. Carry out the *method of thiochrome assay for aneurine hydrochloride,* or *biological assay for aneurine hydrochloride (vitamin* B_1*).*

For riboflavin. Carry out the *microbiological assay of riboflavin.*

For nicotinic acid. Carry out the *chemical method of estimation of nicotinic acid,* or the *microbiological assay of nicotinic acid or nicotinamide.*

Storage. Dried Yeast should be stored in air tight containers.

Preparation. Extractum Saccharomyces Siccum Concentratum.

DOSES

Metric.	Imperial.
2 to 4 grammes.	30 to 60 grains.

SACCHAROMYCES SICCUM CUM CRETA

[Saccharomy. Sicc. c. Cret.]

Dried Yeast with Chalk

Dried Yeast with Chalk contains 1 part of Chalk mixed with 99 parts of Dried Yeast. The mixture is triturated together in a dry porcelain mortar until the mixture becomes uniformly granular.

Dried Yeast with Chalk contains not less than 39 per cent. of protein, and in each gramme, the equivalent of not less than 30 microgrammes of aneurine hydrochloride ($C_{12}H_{17}ON_4SCl.\ HCl.\ H_2O$), 40 microgrammes of riboflavin ($C_{17}H_{20}N_4O_6$) and 250 microgrammes of nicotinic acid ($C_6H_5O_2N$).

Characters. Uniform, fine granular powder, yellowish white to pale yellowish orange. Microscopically, shows the characters of Dried Yeast.

It should not contain starch, corn meal, or other filler.

Tests for Identity and Purity. Suspend Dried Yeast with Chalk in *sterilised water,* plate it on *nutrient agar,* and incubate it at 37·5° for 48 hours; the live bacteria count shall not exceed 7500 per gramme and the mould count shall not exceed 50 per gramme (limit of bacterial and mould count).

Losses, when dried at 100°, not more than 7 per cent. of its weight.

Leaves, on incineration not more than 8·5 per cent. of residue.

Assay. *For calcium.* Incinerate a quantity of Dried Yeast with Chalk and collect the residue. Weigh accurately 1 gramme of the residue and dissolve in 50 millilitres of *water* and 2 millilitres of *hydrochloric acid.* Filter. To the filtrate add 25 millilitres of *dilute solution of ammonium acetate* and a slight excess of *solution of ammonium oxalate;* heat on a water-bath for thirty minutes, set aside for some hours, and filter off the precipitate, wash, dry, moisten with *sulphuric acid,* ignite gently, and weigh the residue. 1 gramme of the residue is equivalent to 0·7353 gramme of calcium carbonate.

For protein, aneurine hydrochloride, riboflavin and nicotinic acid. Same as in Dried Yeast.

Storage. Dried Yeast with Chalk should be stored in air tight containers.

DOSES

Metric.	Imperial.
2 to 4 grammes.	30 to 60 grains.

SAUSSUREA

[Saussu.]

Saussurea

Indian names. Bengali—*Kur;* Gujerathi—*Kut;* Hindi—*Kut, Pachak;* Sanskrit—*Kustha;* Tamil—*Koshtam;* Telegu—*Koshtum.*

Saussurea consists of the dried roots of *Saussurea lappa* Clarke (Fam. *Compositæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Roots, dull rusty red or blackish brown, thick, light, stout, straight, 25 to 75 millimetres long, 25 to 37 millimetres broad, with tubercle-like short protuberances; thick bits, hollow inside. Clear cut surface shows three regions, the outer thin ring like portion containing pericycle and epiblema, the median woody portion of a lighter colour showing fine radial striations, and the inner central portion. Fracture, short, horny. In transverse section, radial rows of xylem strands, 1 to 3 celled thick, developing just interior to the pericycle and running almost to the centre; radial bundles, quite apart from one another, the intermediate space being filled with conjunctive tissues whose cells are small, rounded and thin-walled; numerous big lysigenous cavities inside this tissue; cavities and cells of conjunctive tissue, of epiblema, and of phlœm, contain yellowish and orange-red resins and oil globules. Thin layer of cambium runs parallel on both sides of xylem strands. Some smaller cavities in the epiblema. In tangential section, xylem vessels have scalariform and reticulate type of thickening, cells of conjunctive tissue rectangular. Starch, absent. Odour, aromatic, strong, sweet; taste, somewhat bitter.

Saussurea, in powder form, deep brown or rusty coloured. Microscopically, irregular bits of yellow, brown or orange-red fragments of resins and oils associated with thin-walled parenchymatous cells; broken bits of xylem vessels with scalariform, reticulate thickening and horizontal end walls.

Preparation. Tinctura Saussurea.

SERUM HUMANUM NORMALE

[Ser. Human. Norm.]

Normal Human Serum

CAUTION.—*In any part of India in which Serum Humanum Normale is controlled by law, care must be taken that the provisions of such law are duly complied with.* (*See page ix*)

Normal Human Serum is the sterile serum obtained by pooling approximately equal amounts of the liquid portion of coagulated whole blood from 18 to 20 healthy individuals and sterilized by filtration. Each bleeding of approximately 350 millilitres is drawn under aseptic precautions by means of a closed system into individual sterile bottles and allowed to coagulate, centrifuged, and kept for not less than 72 hours and not more than 120 hours in a cold room or refrigeration at 4° to 5°. The cell-free serum is separated by aspiration in a closed system and pooled into a sterile bottle of adequate capacity. It is

next sterilized by filtration and sterility tests are made by taking at least 3 samples, one at the beginning, the other at the middle and a third at the end of the filtration. The process of filtration and filling into final containers should be done in a closed system. The containers should be efficiently sealed by capping immediately after filtration.

Before issue, individual bottles will be checked in the following way :—Bottles will be stored away from strong light at room temperature (not exceeding 32·2°) for three weeks. At the end of this time, each bottle will be inspected by inversion against light. Any bottle which is not clear will be rejected. If more than 5 per cent. of any batch shows contamination by sterility tests, the entire batch shall be rejected. Contaminated bottles shall not be refiltered but shall be rejected. Refiltration for the removal of fibrin, lipoids or soaps will be considered permissible.

Characters. Normal Human Serum may be dispensed as liquid serum or in a dried condition. Hæmolysis should not be more than 1 per cent., and the hæm-agglutinin titres in the final product should not be more than 1 : 8.

(*a*) *Liquid Serum.* Freshly collected Normal Human Serum is a slightly opalescent liquid of a faint yellowish or amber colour, and practically odourless. A slight, granular deposit or increased opalescence may develop on standing.

(*b*) *Dried Serum.* This is made from liquid Normal Human Serum which has been filtered through bacteria-excluding filter and declared sterile. This serum is properly frozen in a shell form and then dried from the frozen state in vacuum. The dried product should contain as little moisture as possible but not more than 1 per cent. This is determined by exposing 1 or 2 grammes of the sample, evenly distributed, in a weighing bottle not less than 60 millimetres in diameter in a vacuum desiccator at less than 1 millimetre pressure over fresh phosphorous pentoxide at room temperature until the weight remains constant to the third decimal. It has a light yellow to deep cream colour, is microscopically of a honeycomb-like structure and shows no evidence of fusion.

Regulations. The outside label must bear the name Normal Human Serum and indicate the volume of original Normal Human Serum represented in the container, the manufacturer's lot number, the name, address, and the license number of the manufacturer, and the date beyond which the quality of the contents may not be maintained. The label on the bottle containing dried Normal Human Serum should clearly indicate that it should be used as soon after reconstitution as possible.

Tests for Purety. Complies with the Tests for *Absence of Undue Toxicity* (Protein Hydrolysate, etc.,) and with the *sterility tests.*

Storage. Preserve the liquid Normal Human Serum at a temperature between 2° and 10°. On storage, fat and soaps may appear as a grey layer on top of the serum. Such serum may be used. If shaken in transit, fat will make the bottle contents cloudy. Allow to settle. If serum remains uniformly turbid after several days, do not use. Dried Normal Human Serum must not be exposed to excessive heat. Normal Human Serum must be dispensed in the unopened glass container in which it was placed by the manufacturer.

DOSE

By intravenous injection.

Metric.	Imperial.
500 mils.	20 fluid ounces.

SINAPIS

[Sinap.]

Brown Mustard

Synonym. Black Mustard.

Indian names. Bengali—*Raisarisha* ; Hindi—*Rai, Sarson* ; Marathi —*Ravan* ; Sanskrit—*Rajika* ; Tamil—*Kadugu*.

Brown Mustard is the dried ripe seed of *Brassica juncea* (Linn) Cosson, or *Brassica integrifolia* (West) Schulz or of varieties of these species (Fam. *Cruciferæ*). It contains not more than 5 per cent. of other seeds or other foreign organic matter.

Brown Mustard contains not less than 0·6 per cent. of allyl isothiocyanate (C_3H_5NOS).

Characters. Spheroidal or irregularly spheroidal, from 1 to 1·6 millimetres in diameter; testa, dusky red to moderately yellowish brown, minutely pitted or reticulate; embryo, dusky yellowish orange to moderate yellow, oily, with 2 large cotyledons; odour when dry, slight; on crushing and moistening, very irritating, strongly pungent, characteristic; taste strongly pungent, acrid. In powdered form, light olive brown consisting mostly of tissues of the embryo, the cells containing small aleurone grains and a fixed oil, the latter forming in large globules on the addition of a *solution of chloral hydrate* ; fragments of seed coat, conspicuous, with large polygonal areas, enclosing small reddish orange to yellow stone cells, each of the latter with a dark lumen; few or no starch grains.

Assay. Place 5 grammes in *coarse powder*, accurately weighed in a 200 millilitre flask, add 100 millilitres of *water*, stopper tightly, and macerate for 2 hours at about 37°. Add 20 millilitres of *alcohol (95 per cent.)* and distil about 70 millilitres into a 100 millilitre graduated flask containing 10 millilitres of *dilute solution of ammonia*, and 20 millilitres of *N/10 silver nitrate*. Mix thoroughly, stopper the flask, allow the mixture to stand over night. Heat on a boiling water bath, cool, add *water* to make 100 millilitres of mixture, and filter through a dry filter, rejecting the first portions of the filtrate. Acidify 50 millilitres of the filtrate, representing 2·5 grammes of Brown Mustard, with about 5 millilitres of *nitric acid*, and titrate the mixture with *N/10 ammonium thiocyanate*, using 2 millilitres of *solution of ferric ammonium sulphate* as indicator. Each millilitre of *N/10 silver nitrate* is equivalent to 0·004958 gramme of allyl isothiocyanate.

Storage. Brown Mustard should be stored in dry well-closed containers.

Preparations. Emplastrum Sinapis.

NOTE. *In the preparation of powdered Brown Mustard, a portion of its fixed oil and a portion of its seed coat may be removed to facilitate powdering.*

SOLUTIO ADRENALINÆ HYDROCHLORIDI

[Sol. Adrenal. Hydrochlor.]

Solution of Adrenaline Hydrochloride

Synonyms. Liquor Adrenalini Hydrochloricus : Hydrochloric Solution of Adrenaline : Epinephrine Hydrochloride Solution.

Solution of Adrenaline Hydrochloride is a solution of Adrenaline in Hydrochloric acid and Distilled Water, containing in each 100 millilitres not less than 0·090 gramme and not more than 0·110 gramme of $C_9H_{13}O_3N$. It may be prepared as follows :—

Adrenaline	1 gramme.
Chlorobutol or Chlorocresol . .	1 gramme.
Sodium Chloride	9 grammes.
Dilute Hydrochloric Acid . .	3 millilitres.
Potassium Metabisulphite . .	1 gramme.
Distilled Water, freshly prepared, sufficient to produce . . .	1000 millilitres.

Dissolve the Chlorobutol or Chlorocresol and the Sodium Chloride in 900 millilitres of boiling Distilled Water, cool, add the Dilute Hydrochloric Acid, dissolve the Adrenaline in the mixture and add sufficient Distilled Water, recently boiled and cooled, to produce the required volume. Determine the hydrogen-ion concentration of the solution and adjust it to about 2·5.

The containers used comply with the *tests for limit of alkalinity of glass.*

Characters. A nearly colourless, slightly acid liquid, gradually turning dark on exposure to air and light.

Test for Identity. To 10 millilitres add 1 drop of 9 per cent. w/v solution of *ferric chloride.* An emerald green colour is produced changing quickly to cherry red and finally to brown.

Assay. A suitable solution of Adrenaline Hydrochloride injected intravenously into a cat or dog by the prescribed '*pressor assay method in spinal animals*' produces a rise in the systolic blood pressure of the animal corresponding to that produced by an equal amount of a solution of standard chemically pure adrenaline.

N.B. Evidence of potency within 10 per cent. below and 10 per cent. above is acceptable.

Storage. Solution of Adrenaline Hydrochloride should be kept in small well-filled, well-closed, bottles, of amber-coloured resistance glass. The label of the container should indicate the strength of the solution (1 in 1000), the date of manufacture, and the date up to which it is expected to retain its potency, which should not exceed 12 months after date of manufacture.

NOTE. Not for parenteral administration. *If the solution becomes distinctly brown or pink in colour or contains a precipitate, it must be rejected.*

SOLUTIO PYRETHRI

[Sol. Pyreth.]

Pyrethrum Solution

Pyrethrum Solution is an extract of Pyrethrum in Kerosene, and contains not less than 1 per cent. w/v of total Pyrethrins (limits, 0·95 to 1·05).

Characters. A dark coloured greenish liquid with strong odour of Kerosene.

Assay. Measure accurately 10 millilitres into a conical flask of 250 to 300 millilitres capacity and saponify with 30 millilitres of *N/2 alcoholic potassium hydroxide* for one to one and a half hours. After cooling, wash the contents of the conical flask to a separating funnel and allow to separate. Remove the aqueous layer to a 250 millilitre volumetric flask and wash the oily layer twice with 5 millilitre portions of water and add the washings to the main bulk. Complete the Assay as directed under Pyrethrum beginning with the words " add 10 millilitres of solution of *barium chloride*...... .... Pyrethrin II ".

Storage. Pyrethrum solution should be stored in air-tight containers and protected from light.

SPIRITUS CASSIÆ

[Sp. Cass.]

Spirit of Cassia

Spirit of Cassia contains in each 100 millilitres, not less than 9 millilitres and not more than 11 millilitres of Oil of Cassia.

Oil of Cassia	100 millilitres.
Alcohol (95 per cent.) sufficient to produce	1000 millilitres.

Mix.

Assay. Transfer exactly 5 millilitres to a Babcock bottle, graduated to 8 per cent. Attach the bottle to a suction pump, and, while maintaining a relatively high degree of vacuum, evaporate most of the alcohol by repeatedly but carefully immersing the bottle in hot water and immediately withdrawing it. Throughout the operation the bottle must be vigorously rotated, and care must be taken that none of the liquid is drawn out. When most of the alcohol has been removed, cool the liquid, and add exactly 1 millilitre of *kerosene* from a pipette calibrated to deliver that amount, and mix well. Add sufficient saturated solution of *calcium chloride*, acidified with *hydrochloric acid*, almost to fill the bulb of the bottle, rotate it vigorously to insure thorough mixing, and add sufficient of the calcium chloride solution to bring the separated oil into the neck of the bottle. Centrifuge for 5 minutes at about 1500 revolutions per minute, and then read the volume of oil in the stem. Subtract 5 division for the *kerosene* added, and multiply the remaining number of divisions by 4·2 to obtain the volume of Oil of Cassia in 100 millilitres of Spirit of Cassia.

Alcohol content, 80 to 87 per cent. v/v of ethyl alcohol.

Storage. Spirit of Cassia should be stored in air-tight container and protected from light.

DOSES

Metric.	Imperial.
0·5 to 1 mil.	8 to 16 minims.

SPIRITUS PUDINÆ

[Sp. Pudin.]

Spirit of Pudina

Synonym. Essence of Pudina.

Pudina Oil	100 millilitres.
Alcohol (90 per cent.), sufficient to produce	1000 millilitres.

Dissolve. If the solution is not clear, shake with *powdered talc* and filter.

Alcohol content, 80 to 82 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·5 to 1 mil.	8 to 16 minims.

SYRUPUS FERRI PHOSPHATIS CUM QUININA ET STRYCHNINA

[Syr. Ferr. Phosph. c. Quinin. et. Strych.]

Syrup of Ferrous Phosphate with Quinine and Strychnine

Synonym. Easton's Syrup.

Syrup of Ferrous Phosphate with Quinine and Strychnine contains iron, equivalent to 1·8 per cent. w/v of anhydrous ferrous phosphate, $Fe_3(PO_4)_2$, (limits, 1·62 to 1·98), 1·09 per cent. w/v of anhydrous quinine (limits, 1·04 to 1·2), and 0·0246 per cent. w/v of strychnine (limits, 0·022 to 0·027).

Iron	8·6 grammes.
Phosphoric Acid	35·0 millilitres.
Strychnine Hydrochloride	0·3 grammes.
Quinine Hydrochloride	13·3 grammes.
Dilute Hydrochloric Acid	50·5 millilitres.
Syrup	660·0 millilitres.
Glycerin	140·0 millilitres.
Distilled Water, sufficient to produce	1000·0 millilitres.

Dilute the Phosphoric Acid with 70 millilitres of Distilled Water; add it to the Iron in a flask of suitable size, and heat on a water bath until the Iron is dissolved; add to this a solution of the Strychnine Hydrochloride and Quinine Hydrochloride in the 50 millilitres of Dilute Hydrochloric Acid; filter it into the Syrup and Glycerin previously mixed and pass sufficient Distilled Water to produce the required volume.

Assay. *For iron.* Dilute about 20 grammes, accurately weighed, with about 30 millilitres of *water*, add a few drops of *hydrochloric acid*, and a 2 per cent. w/v aqueous solution of *potassium permanganate* drop by drop until a transient pink colour is produced throughout the solution. Add 10 millilitres of *hydrochloric acid* and about 0·5 gramme of *sodium bicarbonate*; then add one drop of *solution of titanous chloride*, or just sufficient for one drop of the mixture to produce a blue colour with one drop of *solution of potassium ferricyanide*. Titrate this solution of ferric iron with *N/10 titanous chloride*, using about 3 millilitres of *solution of ammonium thiocyanate* as indicator. Each millilitre of *N/10 titanous chloride* is equivalent to 0·01192 gramme of $Fe_3(PO_4)_2$.

For quinine. Mix in a separator about 100 millilitres, accurately weighed, with 5 grammes of *sodium citrate*, dissolved in 100 millilitres of *water*. Add 30 millilitres of *solution of sodium hydroxide*, and extract with successive quantities of *chloroform*, until *complete extraction* of the alkaloids is effected, washing each chloroform solution with the same 20 millilitres of water contained in a second separator. Evaporate the chloroform, add to the residue 5 millilitres of *alcohol* (95 per cent.), evaporate, dry at 100°, and weigh the residue of anhydrous quinine and strychnine. Subtract the weight of strychnine obtained in the assay for strychnine.

For strychnine. Dissolve the quinine and strychnine, obtained in the Assay for quinine, in 20 millilitres of *N/1 hydrochloric acid*, and transfer to a separator, washing out the flask with a further 5 millilitres of *N/1 hydrochloric acid*, followed by 25 millilitres of a saturated solution of *sodium chloride*, transferring each washing to the separator. Extract the liquid by shaking with five successive quantities of 25 millilitres of *chloroform*, and for five minutes with each quantity. Wash the mixed chloroform solutions by shaking for five minutes with two quantities of 5 millilitres of a mixture of equal volumes of *N/1 hydrochloric acid* and a saturated solution of *sodium chloride*. Extract the mixed washings by shaking with 10 millilitres of *chloroform*, and add the latter to the mixed chloroform solutions. Shake the mixed chloroform solutions with a mixture of 20 millilitres of *water* and 5 millilitres of *dilute solution of ammonia*; separate and wash the chloroform solution by shaking with 5 millilitres of *water*. Remove the chloroform, add 1 millilitre of *alcohol* (95 per cent.), evaporate, and dry at 100°. Wash the residue with three quantities of 2 millilitres each of a mixture of 2 volumes of *ether* and 1 volume of *light petroleum* (*boiling-point*, 50° to 60°), the solvent having been previously saturated with strychnine. Decant off the solvent each time through a small plug of cotton wool. Wash any alkaloid in the cotton wool back into the flask with 3 millilitres of *chloroform*. Add 1 millilitre of *alcohol* (95 per cent.), evaporate, dry at 100°, and weigh the strychnine.

Determine the *specific gravity* (15·5°/15·5°), and calculate the proportions of anhydrous ferrous phosphate, of anhydrous quinine, and of strychnine, weight in volume.

Storage. Syrup of Ferrous Phosphate with Quinine and Strychnine should be kept in a completely-filled, well-closed container, and protected from light.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

Syrup of Ferrous Phosphate with Quinine and Strychnine contains in 4 mils the equivalent of 0·072 gramme of anhydrous ferrous phosphate, or about 0·034 gramme of iron, about 0·053 gramme of Quinine Hydrochloride, and about 0·0012 gramme of Strychnine Hydrochloride; and in 60 minims the equivalent of about 1 grain of anhydrous ferrous phosphate, or about ½ grain of iron, about 4/5 grain of Quinine Hydrochloride, and about 1/60 grain of Strychnine Hydrochloride.

Syrup of Ferrous Phosphate with Quinine and Strychnine contains approximately one half the proportion of strychnine contained in the corresponding preparation of the British Pharmacopœia, 1914.

SYRUPUS VASAKÆ

[Syr. Vasak.]

Syrup of Vasak

Liquid Extract of Vasaka . .	500 millilitres.
Glycerin	100 millilitres.
Syrup, sufficient to produce . .	1000 millilitres.

Mix the Liquid Extract of Vasaka with the Glycerin and add enough Syrup to make the product measure 1000 millilitres. Mix thoroughly.

Storage. Syrup of Vasak should be stored in well-closed containers.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TALCUM PURIFICATUM

[Talc. Pur.]

Purified Talc

Synonyms. Powdered Talc : Creta Gallica Purificata : Purified French Chalk.

Purified Talc is native magnesium silicate, purified by boiling with dilute hydrochloric acid, decanting the liquid, washing the residue with water and drying at 110°.

Characters. A very fine white or greyish white powder ; tasteless ; odourless. Free from grittiness, readily adheres to the skin, unctuous and greasy to the touch.

Insoluble in water and dilute solutions of acids and alkali hydroxides.

Tests for Identity. Mix 0·5 gramme with about 0·2 gramme of *anhydrous sodium carbonate* and 2 grammes of *anhydrous potassium* carbonate, and heat the mixture in a platinum crucible until fusion is complete. Cool and transfer the fused mixture to a dish or beaker with the aid of about 50 millilitres of hot *water*. Add *hydrochloric acid* to the liquid until it ceases to cause effervescence, then add 10 millilitres more of the acid and evaporate the mixture to dryness on a water bath. Cool, add 20 millilitres of *water*, boil and filter the mixture. Dissolve in the filtrate about 2 grammes of *ammonium chloride*, and add 5 millilitres of *dilute solution of ammonia*. Remove by filtration any precipitate which may form and add *sodium phosphate* to the filtrate ; a white, crystalline precipitate of magnesium ammonium phosphate separates.

Tests for Purity. Digest 2 grammes accurately weighed with 40 millilitres of *dilute hydrochloric acid* for 15 minutes. Filter, evaporate the filtrate, ignite and weigh. The residue does not weigh more than 0·05 gramme (limit of acid-soluble substances).

Boil 10 grammes accurately weighed with 50 millilitres of *water* for 30 minutes, replacing any water lost in evaporation and filter. The filtrate is neutral to *solution of litmus*. Evaporate 25 millilitres of the filtrate, dry at 100° and weigh. The residue does not weigh more than 0·01 gramme (reaction and limit of water-soluble substances).

Boil 5 grammes with 25 millilitres of *water* for 30 minutes, replace any water lost by evaporation and filter. The filtrate after the addition of 5 millilitres of *nitric acid* and dilution to 50 millilitres with *water* complies with the *limit test for iron* (limit of water-soluble iron salts).

1 gramme added to 20 millilitres of *dilute hydrochloric acid* shows no effervescence (absence of carbonates).

Loses, when ignited at a red heat, not more than 3 per cent. of its weight.

Storage. Purified Talc should be stored in well-closed containers.

TETRACHLOROÆTHYLENUM

[Tetrachloreth.]

Tetrachloroethylene

C_2Cl_4 . . . . Mol. Wt. 165·85.

Synonym. Perchloroethylene : Ethylene Tetrachloride.

Tetrachloroethylene may be obtained by heating a mixture of ethylene chloride and chlorine to about 300° to 500° in the presence of a porous surface catalyst.

It contains not less than 99 per cent. and not more than 99·5 per cent. of C_2Cl_4.

Characters. Clear, colourless, mobile liquid having a characteristic, etheral odour, not inflammable. Slowly decomposed by light and various metals in the presence of moisture.

Practically insoluble in *water,* miscible with an equal volume of *alcohol,* with *ether, chloroform, benzene,* and dissolves most of the fixed and volatile oils.

Tests for Purity. Specific gravity at 25°, 1·60 to 1·62; *boiling* point, 118° to 122°.

In each of two 50 millilitre glass stoppered cylinders of colourless glass, having an internal diameter of 20 millimetres place 10 millilitres of *water,* 2 drops of *solution of phenolphthalein* and enough *N/100 sodium hydroxide* to produce after shaking, pink tints of equal intensity. Into one of the cylinders measure exactly 20 millilitres of tetrachloroethylene, and again shake thoroughly. Add *N/100 sodium hydroxide* drop by drop shaking well after each addition, until the pink colour is reproduced in an intensity equal to that in the cylinder without the tetrachloroethylene. Not more than 0·5 millilitre of *N/100 sodium hydroxide* is required to produce a pink colour which persists for 5 minutes (limit of free acid).

Shake 25 millilitres with an equal volume of water for 5 minutes and allow to separate quickly. To 10 millilitres of the aqueous layer add 5 drops of *solution of silver nitrate* and 1 drop of *nitric acid.* No turbidity is produced (absence of chloride ion).

To a further 10 millilitres of the aqueous layer add 5 drops of *solution of potassium iodide and starch.* No blue colour is produced (absence of free chlorine).

Place 20 millilitres in a glass-stoppered cylinder which has been previously moistened with *sulphuric acid.* Add 5 millilitres of *sulphuric acid,* shake vigorously for 5 minutes, and allow the two liquids to separate completely. The acid layer is colourless (absence of readily carbonisable substances).

Place 20 millilitres in a glass-stoppered container, and add 0·1 gramme of *benzidine.* Stopper the container and allow to stand in the dark for 24 hours. The solution shows no turbidity or flocculence (absence of phosgene).

50 millilitres leave, on evaporation and drying at 100°, not more than 0·002 gramme of residue (limit of non-volatile residue).

Storage. Tetrachloroethylene should be stored in air-tight, light-resistant containers.

DOSES

Metric.	Imperial.
2 to 3 mils.	30 to 45 minims.

THYROIDEUM

[Thyroid.]

Thyroid

Synonyms. Thyroideum Siccum : Dry Thyroid : Thyroid Gland.

Thyroid is a cleaned, dried, and powdered thyroid gland previously deprived of connective tissue and fat. It is obtained from domesticated animals which are used as food by man.

It contains 0·2 per cent. of iodine in combination as thyroxine (limits, 0·17 to 0·23), and must be free from iodine in inorganic or any form of combination other than that peculiar to the thyroid gland. A desiccated thyroid of a higher iodine content may be brought to this standard by admixture with a desiccated thyroid of a lower icdine content or with lactose, sodium chloride, starch, or sucrose.

Characters. A cream-coloured, amorphous powder; odour and taste, faint and meat-like.

Tests for Identity. Boil a small quantity for four hours with *N/1 sodium hydroxide*, and adjust the resulting solution to pH 5 by the addition of a 50 per cent. v/v aqueous solution of *sulphuric acid;* when a precipitate is formed. Filter. Dissolve about 0·005 gramme of the precipitate in 2 millilitres of *alcohol (50 per cent.)* with the aid of one drop of *hydrochloric acid*, add one drop of a 20 per cent. w/v solution of *sodium nitrite* in *water;* a yellow colour is produced which deepens on boiling, and changes to red, when the liquid is cooled and treated with excess of *strong solution of ammonia*.

Tests for Purity. Digest 0·35 gramme with 1 millilitre of *strong solution of ammonia* and 9 millilitres of *alcohol (95 per cent.)* for 15 minutes with frequent shaking; filter and evaporate the filtrate on a water-bath; take up the residue with 1 millilitre of *water* and filter again; add to the filtrate 3 drops of *solution of ferric chloride* and 1 millilitre of *chloroform*. The chloroform layer is not coloured violet (limit of inorganic iodine).

Extract about 10 grammes accurately weighed of the sample in a Soxhlet tube for 3 hours using light petroleum (b. p. 50° to 60°) as the solvent. Evaporate the solvent, dry the residue at 110° to remove any possible trace of moisture, and weigh. The weight of the residue should not exceed 0·3 gramme (limit of fat).

Loses, when dried over *sulphuric acid* for 24 hours, not more than 6 per cent. of moisture.

Leaves, on incineration, not more than 4 per cent. of ash soluble in water, and not more than 3·5 per cent. insoluble in water.

Assay. Boil 0·5 gramme with 10 millilitres of *N/1 sodium hydroxide* under a reflux condenser for four hours; add 30 millilitres of *water* and, after cooling to about 40°, 11 millilitres, or a sufficient quantity, of *N/1 sulphuric acid* until the mixture is slightly acid to *Congo-red paper*. Set aside for eighteen to twenty-four hours, and filter through a filter paper, 45 millimetres in diameter, which has been accurately fitted to a funnel, the filter being finally drained by means of a suction pump. Transfer the filter paper with the contents to a nickel crucible about 18 millimetres in diameter, sprinkle a little *anhydrous sodium carbonate* on the surface of the precipitate, and dry at 110°. Crumple up the filter paper, embed it completely in *anhydrous sodium carbonate* in the crucible, invert the crucible and contents into a nickel crucible, 25 millimetres in diameter, and add

sufficient *anhydrous sodium carbonate* to seal the junction of the two crucibles. Heat for fifteen minutes over a Bunsen flame in such a manner that the outer crucible is at a uniform dull red heat; allow to cool, break up the contents of the crucibles, place in 250 millilitre beaker, add 100 millilitres of *water*, and boil gently for ten minutes. Filter, and wash the residue with a little *water*; boil the residue a second time with 100 millilitres of *water* for twenty minutes, again filter, and wash the residue with a little *water*. Transfer the mixed filtrates and washings to a 1 litre flask, cool and add sufficient *water* to produce about 500 millilitres. Add 3 drops of *solution of methyl orange*, and sufficient *sulphuric acid* (50 per cent. v/v) to neutralise the solution. Then add 1 millilitre of *sulphuric acid* (50 per cent. v/v), 0·2 millilitre of *bromine* and a small piece of marble (about 0·35 gramme), and boil briskly for ten minutes. Cool to about 20°, acidify with *acetic acid*, and allow to stand for at least two minutes. Add 5 millilitres of *solution of potassium iodide*, and titrate with *N/20 sodium thiosulphate*, using at the end of the titration *mucilage of starch* as indicator. Each millilitre of *N/20 sodium thiosulphate* is equivalent to 1·058 milligrammes of Iodine.

Storage. Thyroid should be kept in a well-closed container, and stored in a cool place.

DOSES

Metric.	**Imperial.**
0·03 to 0·2 gramme.	**1/2 to 3 grains.**

TINCTURA ACONITI

[Tinct. Aconit.]

Tincture of Aconite

Tincture of Aconite possesses, when assayed by the method given below, a potency per millilitre, equivalent to not less than 0·140 milligramme and not more than 0·160 milligramme of chemically pure aconitine, $C_{34}H_{47}O_{11}N$.

Aconite, in *fine powder* . . .	100 grammes.
Alcohol (95 per cent.) . . .	a sufficient quantity.

Prepare a tincture by the Percolation Process, using a mixture of 3 volumes of Alcohol (95 per cent.) and 1 volume of Distilled Water as the menstruum, collecting only 950 millilitres of the percolate. Assay a portion of the percolate and adjust the volume of the remaining liquid by dilution with the above menstruum, including sufficient Hydrochloric Acid to produce a pH of 3±0·2, so that the finished tincture will conform to the biological standard given hereunder.

Assay. In this assay, guineapigs weighing from 250 grammes to 350 grammes may be used but they must be from a colony of guineapigs kept under identical conditions. For each assay, the weight of the animals used for both the preparation being tested and for the aconitine, must not vary by more than 50 grammes.

Dilute a portion of the percolate (or of Tincture of Aconite, if the finished tincture is being assayed), using sufficient *water* to make the dose about 1 millilitre, and inject this dilution under the skin of the abdomen of the guineapigs.

Prepare a solution of *aconitine* in *alcohol* (90 per cent.), by volume, in a proportion of exactly 15 milligrammes of aconitine in each 100 millilitres of *water* and adjust the pH of the solution, by the addition of *hydrochloric acid*, to 3 ± 0·2. This alcoholic solution may be preserved in sealed ampoules but such solutions must be checked for potency against freshly prepared solutions at least every six months and discarded if not of standard potency.

Dilute this solution of aconitine in sufficient *water* to make the dose about 1 millilitre and inject it as directed for the preparation under test.

By this means determine the doses of *chemically pure aconitine* and of the preparation being assayed which will kill not more than seven and not less than three animals of groups of ten animals, within six hours. If the respective mortalities from aconitine and the preparation being assayed differ by not more than two animals, the doses may be considered equivalent.

NOTE. *Owing to many variable factors in the standardisation of Aconite and Tincture of Aconite, evidence of potency, in all assays, to within 20 per cent. above or below the standard, is acceptable.*

Alcohol content, 65 to 70 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·3 to 0·6 mil.	5 to 10 minims.

TINCTURA ARISTOLOCHIÆ

[Tinct. Aristoloch.]

Tincture of Aristolochia

Aristolochia, in *No. 40 powder* .	200 grammes.
Alcohol (70 per cent.), sufficient to produce	1000 millilitres.

Prepare by the Percolation Process.

Alcohol content, 60 to 65 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA BERBERIDIS

[Tinct. Berber.]

Tincture of Berberis

Tincture of Berberis contains 0·2 per cent. of total alkaloids calculated as berberine (limits, 0·18 to 0·22).

Berberis, in *No. 60 powder* . .	200 grammes.
Alcohol (60 per cent.) . . .	sufficient quantity.

Exhaust the drug by the Percolation Process reserving the first 500 millilitres of the percolate. Recover the alcohol from the remainder of the percolate by distillation at a reduced pressure and dissolve the residue in the reserved portion. Add sufficient Alcohol (60 per cent.) to make the volume 1000 millilitres.

Assay. Evaporate 40 millilitres on the water bath and transfer the residue with a little *water* to a 200 millilitre flask. Add 10 millilitres of 15 per cent. w/v *sodium hydroxide* and shake for 10 to 15 minutes with 100 millilitres of *ether*. Add 1 gramme of powdered *tragacanth* and shake again until the ether settles to a clear liquid. Precipitate 50 millilitres of the ethereal solution (equivalent to 20 millilitres of tincture) by 10 millilitres of solution of *picrolonic acid*, filter, dry and weigh. The weight multiplied by 5 × 0·5610 gives the percentage content of berberine.

Alcohol content, 55 to 60 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA CANNABIS

[Tinct. Cannab.]

Tincture of Cannabis

Extract of Cannabis . . .	100 grammes.
Alcohol (90 per cent.) . . .	800 millilitres.

Dissolve ; filter, if necessary.

Carry out the assay by the method given below and adjust the strength of the tincture of Cannabis either by dissolving more extract of Cannabis in the same volume of the Tincture of Cannabis or by addition of *Alcohol (90 per cent.)*.

Assay. Use adult cats and dogs (cats, from 2·0 to 3·0 kilograms ; dogs, 10 to 15 kilograms). Keep the animal in the laboratory for at least 4 days before experiment. Fast the animal over night before the drug is given by means of a Ryle stomach tube. Observations should be made within one to one-half hours after administration, in a dosage of 0·03 to 0·06 millilitre for each kilogram of body weight. In susceptible animals (this has to be determined by preliminary experiments), an initial excitement, followed by inco-ordination, rocking movements of the head, sluggish corneal reflex, somnolence and sometimes mild narcosis may be observed.

Alcohol content, 85 to 90 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·03 to 0·1 mils	1/2 to 1½ minims.

TINCTURA CARDAMOMI COMPOSITA

[Tinct. Cardam. Co.]

Compound Tincture of Cardamom

Cardamom, in *moderately coarse powder*	14 grammes.
Caraway, in *moderately coarse powder*	14 grammes.
Cinnamon, in *moderately coarse powder*	28 grammes.
Amaranth	1 gramme.
Alcohol (45 per cent.), sufficient to produce	1000 millilitres.

Prepare by the Percolation Process. Filter, if necessary.

Alcohol content, 40 to 45 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA CATECHU NIGRI

[Tinct. Catech. Nig.]

Tincture of Black Catechu

Black Catechu, in *No. 40 powder* .	200 grammes.
Cinnamon, bruised . . .	50 grammes.
Alcohol (45 per cent.) . . .	1000 millilitres.

Prepare by the Maceration Process.

Alcohol content, 40 to 45 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA CHIRATÆ COMPOSITA

[Tinct. Chirat. Co.]

Compound Tincture of Chirata

Chirata, cut small and bruised .	100 grammes.
Dried Sweet-Orange Peel, bruised .	37·5 grammes.
Cardamom, bruised . . .	12·5 grammes.
Alcohol (45 per cent.) . . .	1000 millilitres.

Prepare by the Maceration Process.

Alcohol content, 41 to 45 per cent. of v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA EPHEDRÆ

[Tinct. Ephed.]

Tincture of Ephedra

Tincture of Ephedra contains 0·5 per cent. w/v of total alkalaids of Ephedra, calculated as ephedrine (limits 0·475 to 0·525).

Liquid Extract of Ephedra . .	250 grammes.
Alcohol (40 per cent.), sufficient to produce	1000 millilitres.

Mix ; filter, if necessary.

Assay. Evaporate 100 millilitres of the tincture to about 10 millilitres at a temperature not exceeding '80°', transfer it to a separating funnel, add 10 millilitres of *water*, and 10 millilitres of *dilute solution of ammonia ;* carry out the Assay as directed under Liquid Extract of Ephedra, beginning with the words "extract with 20 millilitre portions of a mixture of 3 volumes of *ether* and 1 volume of *chloroform* until.............".

Alcohol content, 45 to 50 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
6 to 8 mils.	90 to 120 minims.

TINCTURA KINO

[Tinct. Kino.]

Tincture of Kino

Kino, in *moderately coarse powder* .	200 grammes.
Distilled water	sufficient quantity of each.
Alcohol (90 per cent.) . . .	

Place the Kino in a capacious flask, and pour on it 500 millilitres of boiling Distilled water. Agitate the mixture thoroughly, and heat for one hour on a water bath, shaking frequently. Allow the liquid to cool. Add enough recently boiled Distilled water to make the product measure 500 millilitres and add 500 millilitres of Alcohol

(90 per cent.). Stopper the flask, set aside in a cool place for tewnty-four hours, and decant the mixture through cheese cloth.

Alcohol content, 40 to 45 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
1 to 2 mils.	15 to 30 minims.

TINCTURA LOBELIÆ ÆTHEREA

[Tinct. Lobel. Æther.]

Ethereal Tincture of Lobelia

Ethereal Tincture of Lobelia contains 0·06 per cent. w/v of the total alkaloids of lobelia, calculated as lobeline (limits 0·055 to 0·065).

Lobelia, in *moderately coarse powder*	200 grammes.
Spirit of Ether	sufficient quantity.

Pack the powder uniformly in a conical percolator, and add sufficient Spirit of Ether to saturate the drug. When liquid begins to drop from the percolator close the outlet, add sufficient Spirit of Ether to leave a layer above the drug, and allow maceration to continue for twenty-four hours. Allow percolation to proceed slowly, until the percolate measures about 750 millilitres. Press the marc, and mix the expressed liquid with the percolate. Determine the proportion of lobeline in the tincture so prepared by the Assay described below and adjust it to the standard strength by the addition of a stronger or weaker Ethereal Tincture of Lobelia.

Assay. Evaporate 50 millilitres on a water bath to about 10 millilitres, add 20 millilitres of *water* and transfer to a separating funnel using a small amount of *alcohol* if necessary. Acidify with 30 millilitres of *N/1 sulphuric acid*. Wash the solution with two portions of 10 millilitres of *chloroform* and run off the chloroform layer to a second separator containing 20 millilitres of *N/2 sulphuric acid*, shake, allow to separate and reject the chloroform. Transfer the acid liquid from the second separator to the first separator. Carry out the Assay as directed under 'Lobelia' beginning with the words "make neutral to solution of litmus with *dilute solution of ammonia*.......... .... to 0·00674 gramme of lobeline".

Alcohol content, 55 to 63 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·3 to 1 mil.	5 to 15 minims.

TINCTURA PICRORHIZÆ COMPOSITA

[Tinct. Picrorh. Co.]

Compound Tincture of Picrorhiza

Picrorhiza, cut small and bruised .	100 grammes.
Dried Sweet-orange Peel, bruised .	37·5 grammes.

Cardamom, bruised	12·5 grammes.
Alcohol (45 per cent.)	1000 millilitres.

Prepare by the Maceration Process.

Alcohol content, 40 to 45 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINCTURA RAUWOLFIÆ

[Tinct. Rauwolf.]

Tincture of Rauwolfia

Tincture of Rauwolfia contains 0·25 per cent. of the total alkaloids of Rauwolfia (limits 0·23 to 0·27).

Liquid Extract of Rauwolfia . .	250 grammes.
Alcohol (90 per cent.) sufficient to produce	1000 millilitres.

Mix. Set aside for not less than twelve hours ; filter.

Assay. Evaporate 100 millilitres to about 10 millilitres under reduced pressure and transfer the residue to a separator adding sufficient *alcohol (90 per cent.)* to dissolve any separated substance, rinsing the vessel with a little *water*. Add 10 millilitres of *water*, 5 millilitres of *dilute solution of ammonia* and shake with successive portions of *chloroform* until *complete extraction* of the alkaloid is effected. Shake the mixed chloroform solutions with successive portions of *N/2 sulphuric acid* until complete extraction of the alkaloid is effected. Complete the assay as directed under Rauwolfia beginning with the words " filter the combined total alkaloids............ ".

Alcohol content, 85 to 90 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
0·8 to 2 mils.	12 to 30 minims.

TINCTURA SAUSSUREÆ

[Tinct. Saussur.]

Tincture of Saussurea

Saussurea, in *No. 40 powder* . .	2000 grammes.
Alcohol (90 per cent.)	a sufficient quantity.

Exhaust the drug by the Percolation Process reserving the first 800 millilitres of the percolate. Recover the alcohol from the remainder of the percolate by distillation under reduced pressure and dissolve

the residue in the reserved portion. Add sufficient Alcohol (90 per cent.) to make the volume 1000 millilitres.

Alcohol content, 85 to 90 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
1 to 4 mils.	15 to 60 minims.

TINCTURA TINOSPORÆ

(Tinct. Tinosp.)

Tincture of Tinospora

Tinospora, in No. 20 powder . . 200 grammes.

Alcohol (60 per cent.), sufficient to produce . . . . . 1000 millilitres.

Prepare by the Percolation Process.

Alcohol content, 55 to 60 per cent. v/v of ethyl alcohol.

DOSES

Metric.	Imperial.
2 to 4 mils.	30 to 60 minims.

TINOSPORA

[Tinosp.]

Tinospora

Indian names. Bengali, Hindi and Oriya—*Gulancha ;* Gujerathi—*Gulevel ;* Marathi—*Gulaveli ;* Sanskrit—*Amritavalli,* Tamil—*Amridavalli.*

Tinospora consists of the dried stems with the bark intact of *Tinospora cordifolia* Miers (Fam. *Menispermaceæ*), collected in the hot season. It contains not more than 2 per cent. of other foreign organic matter.

Characters. Light, cylindrical pieces of wood, in bits up to 15 or 20 centimetres long and about 2 to 3 centimetres in diameter; bark, light brown, with transverse markings and marks of lenticles, thin, papery, easily separable from the wood. Dry wood easily breaks into wedge-shaped longitudinal pieces. The separation occurs radially along the medullary rays. Wood soft, lustre dull, fracture short and smooth. Microscopically, wood characteristic. Large number of vessels are present which attain a fairly big size, pores often visible to the naked eye. Xylem parenchyma, tracheids and wood fibres comparatively less in proportion to the vessels. Slit-like bordered pits occur on the walls of the vessels. Medullary rays quite distant from one another, and often disintegrate in dry wood. Starch, present in ray cells and secondary phlœm cells. Phlœm, present as caps over the metaxylem. Cork-cells, elliptic and contains a brownish pigment in their wall. Stone cells, absent in the periderm.

Tests for Identity. An aqueous decoction gives with *solution of iodine,* the deep blue colour indicative of starch.

Preparation. Tinctura Tinosporæ.

TRAGACANTHA

[Trag.]

Tragacanth

Synonyms. Garmezu : Chitral Gum.

Indian name. Hindi—*Anjira.*

Tragacanth is the dried gummy exudation obtained by incision from *Astragalus strobiliferus* Royle. (Fam. *Leguminosæ*) and is known in commerce as 'Chitral Gum'. It contains not more than 2 per cent. of other organic matter.

Characters. White, flattened, lamellated, tough, ribbon-shaped pieces of horny structure, about 2·5 centimetres in length, more or less curved or contorted ; fracture short ; rendered more easily pulverisable by heating to 50° ; odourless ; taste, insipid and mucilaginous.

Tests for Identity. To 4 millilitres of a 0·5 per cent. w/v solution in *water*, add 0·5 millilitre of *hydrochloric acid* and heat for thirty minutes on a water-bath. Divide the liquid into two parts :—

To one part add 1·5 millilitres of *solution of sodium hydroxide* and 3 millilitres of *solution of potassio-cupric tartrate* and warm in water-bath ; a red precipitate is produced.

To the remainder add *solution of barium chloride ;* no precipitate is produced (distinction from agar).

When powdered it does not acquire a pink colour with *solution of ruthenium red* (distinction from sterculia gum and from agar).

On the addition of *N/10 iodine,* it acquires an olive-green colour (distinction from acacia and from agar).

Tests for Purity. Add 1 gramme to 50 millilitres of *water ;* it swells and forms a smooth, nearly uniform, stiff, opalescent mucilage, free from cellular fragments ; the mucilage on treatment with *N/50 iodine* gives no blue colouration but scattered blue specks may sometimes be observed (absence of starch).

Boil 1 gramme with 20 millilitres of *water* until a mucilage is formed, add 5 millilitres of *hydrochloric acid* and again boil the mixture for 5 minutes ; no pink or red colour develops (absence of Karaya Gum).

Ash, not more than 3 per cent. ; *acid-insoluble ash,* not more than 0·5 per cent.

Preparations. Mucilago Tragacanthæ.
Pulvis Tragacanthæ Compositus.

TRICHLOROÆTHYLENUM

[Trichloroeth.]

Trichloroethylene

C_2HCl_3 . . . . Mol. Wt. 131·40

Trichloroethylene may be obtained by reducing hexachlorethane with zinc dust and dilute sulphuric acid.

It contains not less than 99 per cent. and not more than 99·5 per cent. of C_2HCl_3, the remainder consisting of alcohol.

Characters. A clear, colourless, mobile liquid; odour, characteristic, resembling that of *chloroform*. Slowly decomposed by light in the presence of moisture. Not inflammable.

Practically insoluble in *water;* miscible with *dehydrated alcohol*, with *ether*, with *chloroform*, and dissolves most fixed and volatile oils.

Tests for Purity. *Specific gravity* (25°/25°), 1·456 to 1·462; *boiling-point*, not less than 99 per cent. distils over between 86° and 88°.

Allow 50 millilitres to evaporate from a platinum basin or a tared dish on a water-bath, and dry the residue at 110° for 2 hours; the residue shall not weigh more than 1 milligramme (limit of non-volatile residue).

Shake 25 millilitres with an equal volume of *water* for 5 minutes, and allow the liquids to separate completely. Draw off the aqueous layer and to 10 millilitres add 5 drops of *solution of silver nitrate* and 1 drop of *nitric acid;* no turbidity results (absence of chloride ions).

To 10 millilitres, add 2·5 millilitres of *solution of potassium iodide and starch*. Shake for 1 minute; no blue colour appears (absence of free chlorine).

Mix 10 millilitres each of a 1 per cent. w/v solution of *p-dimethylaminobenzaldehyde* and *diphenylamine* in acetone. Add to this 10 millilitres of *trichloroethylene* and shake. Allow to stand. No yellow colour develops in 15 minutes (absence of phosgene).

Agitate gently 5 millilitres with 2 millilitres of *solution of silver ammonium-nitrate;* no turbidity shall be observed in either layer within 10 minutes (absence of acetylene).

To 50 millilitres add 50 millilitres of *water*, shake in a separating funnel, run the lower layer into a second funnel and the aqueous layer to a stoppered receiver. Repeat twice. Titrate the combined aqueous layer with *N/100 sodium hydroxide* using 0·2 millilitre of *methyl red*, (0·5 gramme of water-soluble methyl red per 1000 millilitres) as indicator. Not more than 0·5 millilitre of *N/100 sodium hydroxide* is required to produce a pink colour which persists for 15 minutes. Correct the titre by doing a blank test on 150 millilitres of the water used (limit of acidity).

Transfer 5 millilitres to a glass stoppered cylinder, add 5 millilitres of *solution of bromine* and shake the mixture vigorously at intervals of 15 minutes; at the end of 1 hour a white turbid solution forms in the lower layer (distinction from chloroform and carbon tetrachloride).

Storage. Trichloroethylene should be stored in sealed ampoules or bottles protected from light and kept in a cool place.

NOTE. *Trichloroethylene for anæsthetic use may contain ammonium carbonate, not in excess of 20 milligrammes per 100 millilitres as a preservative.*

TURPETHUM

[Turpeth.]

Turpeth

Synonyms. Indian Jalap: Safed Turbuj.

Indian names. Bengali—*Dudiva-kalmi;* Gujerathi—*Nishotar;* Hindi—*Pitohri;* Kanarese—*Bilitigadu;* Marathi—*Nishottara;* Punjabi—*Misot;* Sanskrit—*Triyrit;* Santali—*Bana ctika;* Tamil—*Shivadai;* Telegu—*Tella tegada.*

Turpeth consists of the dried roots of the white variety of *Ipomœa turpethum* R. Br (Fam. *Convolvulaceæ*) with the bark intact.

It contains not more than 2 per cent. of other organic matter and not less than 5 per cent. of resin, part of which is soluble in ether.

Characters. In grey or reddish-grey cylindrical pieces, 1·5 to 5 centimetres in diameter, the thicker pieces often split. Externally, deeply furrowed longitudinally, giving a ropelike appearance. Fracture, short in the bark, fibrous in the wood. Transverse surface, light brown, showing in the xylem very large vessels and wide medullary rays containing starch. Resin cells and abnormal vascular bundles are present. The latter, appearing as dark coloured lines arranged mostly in concentric manner, give rise to successive rings of growth. Odour, not characteristic ; taste, slightly acrid.

Tests for Identity. To 0·5 gramme of the resin, obtained by exhausting the powdered drug with *alcohol (90 per cent.)*, add 5 millilitres of *dilute solution of ammonia*, and shake well for 15 minutes. No red colour is produced in 15 minutes and the mixture exhibits a light blue fluorescence in filtered ultraviolet light.

Assay. Exhaust about 20 grammes in *coarse powder*, accurately weighed, by *continuous extraction* with boiling *alcohol (90 per cent.)*. Usually six extractions suffice. Collect the alcohol extractions and evaporate. Wash the residue with boiling *water* 3 or 4 times, dry at 100° and weigh.

Preparation. Pulvis Turpethum Compositum.

DOSES

Metric.	Imperial.
3 to 5 grammes.	45 to 75 grains.

UNGUENTUM MYROBALANI

[Ung. Myrobal.]

Myrobalan Ointment

Myrobalan, in fine powder . .	20 grammes.
Paraffin ointment	80 grammes.

Mix thoroughly by trituration.

UNGUENTUM MYROBALANI CUM OPIO

[Ung. Myrobal. c. Opio.]

Myrobalan and Opium Ointment

Synonym. Unguentum Myrobalani Compositum.

Powdered Opium, in fine powder .	7·5 grammes.
Myrobalan Ointment . . .	92·5 grammes.

Mix thoroughly by trituration.

UNGUENTUM PYRETHRI

[Ung. Pyreth.]

Pyrethrum Ointment

Pyrethrum, *in fine powder* . .	10 grammes.
Paraffin ointment	70 grammes.

Mix thoroughly by trituration.

UREA STIBAMINUM

[Urea Stibam.]

Urea Stibamine

CAUTION. In any part of India in which Urea Stibamine is controlled by law, care must be taken that the provisions of such law are duly complied with (See page ix).

Urea Stibamine is obtained by the interaction of p-aminophenyl stibinic acid with urea. The chemical constitution of urea stibamine is not known.

It contains not less than 38 per cent. and not more than 42 per cent. of antimony.

Characters. A pale greyish, pale brownish or pinkish, amorphous, dry powder, free from grittiness and freely mobile in contact with glass surfaces.

Readily soluble in cold *water ;* almost insoluble in *chloroform, ether, acetone* and *light petroleum ;* partly soluble in *dehydrated alcohol.*

Tests for Identity. Ammonia is evolved when the material is heated in a dry test tube.

Urea stibamine, after oxidation of organic matter as in the assay process yields the *reactions* characteristic of antimony.

Tests for Purity. A 2 per cent. w/v aqueous solution is clear, neutral, stable, and does not become turbid on standing for at least one hour.

Complies with the *test for absence of undue toxicity* (Urea Stibamine).

Assay. *For antimony.* Weigh accurately about 0·05 gramme, transfer to a dry conical flask of about 125 millilitre capacity, add approximately 2 grammes of *potassium sulphate,* 3 millilitres of *sulphuric acid As. T.* and a few strips of quantitative filter paper. Heat the mixture, at first gently over a small flame, gradually raise the temperature and finally heat strongly until almost a colourless solution is obtained. Allow to cool, add 25 millilitres of *water* and boil for 5 to 10 minutes. Add 5 millilitres of *hydrochloric acid* to the warm solution and cool immediately. Make up the volume to 100 millilitres. Take an aliquot part, 25 millilitres, make alkaline with a 40 per cent. w/v solution of *sodium hydroxide,* acidify with 1 per cent. w/v solution of *tartaric acid* and finally make alkaline with 4 per cent. w/v solution of *sodium bicarbonate.* Titrate with *N/100 Iodine,* using mucilage of starch as indicator. 1 millilitre of *N/100 iodine* is equivalent to 0·0006088 gramme of antimony.

Storage. Urea Stibamine should be kept in perfectly dry and sterile ampoules, sealed under partial vacuum or under nitrogen at a temperature below 30°. If it has become darker in colour or the colour is significantly changed, it should not be used.

Sterilisation of a Solution. Urea Stibamine is prepared for injection by dissolving the sterile contents of a sealed container in the requisite amount of *Sterilised water*, the solution being used immediately after preparation.

DOSES

By intravenous injection.

Metric.	Imperial.
0·05 to 0·2 gramme.	3/4 to 3 grains.

VACCINUM PESTIS FORMOLYSATUM

(Vaccin. Pest. Formol.)

Formolised Anti-Plague Vaccine

Synonyms. Plague Vaccine : Haffkine's Plague Vaccine.

CAUTION. In any part of India in which Anti-plague vaccine is controlled by law, care must be taken that the provisions of such law are duly complied with (See page ix).

Formolised Anti-plague vaccine is an uncontaminated culture of micro-organisms, *Pasteurella pestis*, grown in liquid media (*e.g.*, Acid hydrolysate of casein) and killed by the addition of formaldehyde. It should have a minimum mouse protection dose of 0·004 mils. or less.

It may be prepared in the following way. A fresh sub-culture of *Pasteurella pestis* is selected which has been examined to ensure its identity and purity and which has been tested for virulence and antigenic efficiency by animal experiments. The culture medium used is an acid hydrolysate of casein having a pH of 7·2 and a nitrogen content of 250 to 270 milligrammes per 100 millilitres. A forty-eight hour culture of the selected strain of *P. pestis* is prepared in this medium, in a Pasteur balloon flask, and this is used to inoculate three litre Haffkine flasks each of which contains one litre of the acid hydrolysate medium. The Haffkine flasks are incubated at 28° for 15 days. The cultures are then killed by the addition of Solution of Formaldehyde, in a concentration of 0·1 per cent., which is allowed to remain for 7 days at 37°. Tests for purity and sterility are carried out at appropriate stages during the process of manufacture. The killed cultures are preserved by the addition of phenyl-mercuric-nitrate in the proportion of 1·5 milligrammes per 100 millilitres of the vaccine, or by some other suitable preservative. The

finished vaccine is distributed, under aseptic conditions, into previously sterilised containers, which are sealed so as to exclude bacteria.

Characters. A brownish turbid liquid, with or without flakes or clumps.

Tests for Purity. It complies with the *tests for sterility,* and *tests for freedom from abnormal toxicity.*

Assay. Determine the potency by the *biological assay of plague vaccine.*

Storage. Anti-Plague Vaccine should be stored at a tempeature of 0·0° to to 4·0°, and should not be used later than three years after preparation.

DOSES

By subcutaneous injection.

1·0 mil (first dose).

1·0 mil. (second dose after 7 to 10 days interval).

VACCINUM RABIES CARBOLISATUM

(Vaccin. Rabies Carbol.)

Carbolised Anti-Rabic Vaccine

Synonyms. Carbolised Rabies Vaccine : Pasteur Treatment : Semple's Vaccine.

CAUTION. In any part of India in which Carbolised Rabies Vaccine is controlled by law, care must be taken that the provisions of such law are duly complied with (See page ix).

Carbolised Anti-rabic vaccine is an uncontaminated suspension of brain substance containing fixed virus of rabies, inactivated by the addition of phenol.

It may be prepared in the following way. A suitable strain of rabies fixed virus is maintained by passage in rabbits. Healthy animals (preferably, sheep) are inoculated sub-durally with a suspension of the brain substance of a rabbit in which the fixed virus has been passaged. When the animal has died, or has been killed when moribund, after showing characteristic symptoms of infection with rabies fixed virus, the brain is removed under aseptic conditions, is tested for absence of bacteria, and is emulsified in Physiological Solution of Sodium Chloride so as to form an 8 per cent. suspension of brain substance. Phenol to make a concentration of 1 per cent. is added and the concentrated suspension is incubated at 37° for 24 hours to kill the virus. The concentrated suspension is then diluted with Physiological Solution of Sodium Chloride to make a final concentration of 5 per cent. brain substance, and, the phenol content is adjusted to 0·5 per cent. The finished vaccine is distributed,

under aseptic conditions, into previously sterilised containers, which are sealed so as to exclude bacteria.

Characters. A white or whitish, more or less turbid liquid having a slight odour of phenol.

Tests for purity. Complies with the *tests for sterility* and *tests for freedom from abnormal toxicity*.

Storage. Carbolised Anti-Rabic Vaccine should be stored at a temperature between 2° to 10°, preferably at the lower limit. It shall not be issued for use until after the lapse of at least 10 days from the date of addition of phenol. A test for presence of phenol must be made before issue.

DOSES

By subcutaneous injection.

2-10 mils. daily for 7 to 14 days according to the site and severity of the bite and the risk to the patient.

VASAKA

[Vasak.]

Vasaka

Indian names. Bengali—*Bakas, Vasaka*; Gujerathi—*Ardusi*; Hindi—*Adulsa*; Marathi—*Baksa*; Oriya—*Basongo*; Punjabi—*Bhaikar*; Tamil—*Adhatodai.*

Vasaka consists of the fresh and dried leaves of *Adhatoda vasica* Nees. (Fam. *Acanthaceæ*). It contains not more than 2 per cent. of other organic matter.

Characters. Leaves, 12 to 20 centimetres long, 2·5 to 5 centimetres broad, lanceolate, one-nerved, entire, petiolate, taper-pointed, thin, leathery, smooth on both sides, with fine hairs both on the blade and on the petiole. Dried leaves, dull brown above, light greyish brown below. Microscopically, caryophyllaceous stomata on both surface, more numerous on the lower; epidermal cells, wavy in outline, Epidermis bear few 1 to 3 celled thinwalled warty trichomes, and small sessile brown quadricellular glands. Cystoliths, both in the palisade and spongy layers. Palisade ratio 4·5 to 5·5. In powder form, greyish brown, 2 to 4 celled warty hairs, quadricellular glands, wavy walls of epidermal cells, caryophyllaceous stomata, cystoliths; starch, absent; spiral and spiral-reticulate vessels. Odour, tea-like; taste, bitter.

Preparations. Extractum Vasakæ Liquidum.
Syrupus Vasaka.

DOSES

Metric.	Imperial.
1 to 2 grammes.	15 to 30 grains.

VENENUM NAJÆ

(Ven. Naj.)

Cobra Venom.

Indian name. Bengali—*Keuter bish.*

Cobra venom is the dried secretion obtained from the poison gland of *Naja tripudians* and other species of *Naja* (Fam. *Colubridæ*). The poi-

sonous secretion is dried from frozen state immediately after extraction. Such lyophilised venom is pooled, mixed thoroughly, dissolved in ice-cold *water for injection* to make a 1-500 solution and filtered through bacteria-proof filter. Further dilutions are then made with *water for injection* so as to give the required number of mouse units in 1·0 mil. These are distributed in single doses in sterile neutral glass containers and sealed so as to exclude bacteria; or dried from the frozen state and sealed in vacuo. All the operations after filtration through bacteria-proof filters are carried out under aseptic conditions.

Cobra venom contains in 1 milligramme of the dry powder not less than 50 mouse units.

Characters. Almost white or very light-yellow dry powder. Soluble in water to form a clear solution; insoluble in *methyl alcohol*.

A solution of cobra venom produces, in presence of lecithin, haemolysis of Red Blood corpuscles suspended in isotonic saline (distinction from Viper venom).

Tests for Purity. Cobra venom in dry form complies with the *sterility tests for solids* and cobra venom in solution complies with *tests for sterility*.

Assay. Carry out the *biological assay of cobra venom* and express the potency in terms of mouse units per milligramme of the dry powder.

Storage. Dry cobra venom in single doses should be kept in sealed containers in a cool atmosphere and protected from light.

Cobra venom in solution in single doses should be kept in dark at a temperature of 2—5°, and should be used within 3 months of the date of manufacture.

DOSES

By intramuscular injection.

Initial dose—1 to 3 mouse units.

Subsequent doses—5 to 25 mouse units or more in gradually increasing doses.

NOTE.—*In case of the dried venom the contents of a sealed container should be dissolved in 1 millilitre of water for injection immediately before use.*

VENENUM VIPERÆ

[Ven. Viper]

Viper Venom

Synonym. Daboia Venom.

Indian names. Bengali—*Chandraborar bish.*

Viper venom is the dried secretion obtained from the poisonous glands of *Vipera russelli* and other species of *Viperæ* (Fam. *Viperidæ*). The poisonous secretion is dried from frozen state immediately after extraction. Such lyophilised venom is pooled, mixed thoroughly, dissolved in ice-cold *water for injection* to make a 1-500 solution and

filtered through bacteria-proof filter. Further dilutions are made with *water for injection* so as to give the required number of mouse units in 1.0 mil. These are distributed in single doses in sterile neutral glass containers and sealed so as to exclude bacteria, or dried from the frozen state and sealed in vacuo. All the operations after filtration through bacteria-proof filters are carried out under aseptic conditions.

Viper venom contains in 1 milligramme of the dry powder not less than 30 mouse units.

Characters. Almost white or very light yellow dry powder, soluble in water to form a clear solution; insoluble in *methyl alcohol.*

Viper venom produces coagulation of citrated human plasma (distinction from cobra venom).

Tests for Purity. Viper venom in dry form complies with the *sterility tests for solids* and viper venom in solution complies with *tests for sterility.*

Assay. Carry out the *biological assay of viper venom* and express the potency in terms of mouse units per milligramme of the dry powder.

Storage. Dry Viper venom in single doses should be kept in sealed containers in a cool atmosphere and protected from light.

Viper venom in solution in single doses should be kept in dark at a temperature of 2°—5°, and should be used within 3 months of the date of manufacture.

DOSES

By intramuscular injection.

Initial dose—1 to 3 mouse units.
Subsequent doses—5 to 25 mouse units or more in gradually increasing doses.

By local application.

A 1 in 10,000 solution may be used as a local haemostatic.

NOTE.—*In case of the dried venom the contents of a sealed container should be dissolved in 1 millilitre of water for injection immediately before use.*

VERNONIA

[Verno.]

Vernonia

Indian names. Bengali and Hindi—*Somraj*; Gujerathi—*Kali-jiri*; Kanarese—*Kadu-jirage*; Malayalam—*Kattu-jirakam*; Marathi—*Rana-dha-jire*; Punjabi—*Kali-ziri*; Sanskrit—*Vakuchi*; Tamil—*Kattu-chchirakam*; Telegu—*Adavi-jilakara.*

Vernonia consists of the fresh dried seeds of *Vernonia anthelmintica* Willd. (Fam. *Compositæ*) with the glandular hairs intact. It contains not more than 2 per cent. of other organic matter.

Vernonia contains 0·7 per cent. of bitter principles.

Characters. Dark brown, about 0·5 centimetre long, covered with whitish scattered hairs, cylindrical, tapering towards the base, marked with about 10 longitudinal ridges, and crowned with circles of short brown scales. Odour, none ; taste, nauseous and bitter.

Assay. Exhaust about 20 grammes of the whole seeds, accurately measured, with alcohol (90 per cent.) in a percolator. Distil off the alcohol and extract the residue repeatedly with chloroform. Filter the chloroform extracts, concentrate and precipitate the bitter substance with light petroleum (boiling point 40° to 50°). Dry the precipitate so obtained and weigh.

DOSES

Metric.	Imperial.
1 to 2 grammes.	15 to 30 grains.

APPENDICES

APPENDIX I

MATERIALS AND SOLUTIONS EMPLOYED IN TESTS

Aconitine : $C_{34}H_{47}O_{11}N$, of Reagent purity.

Alcohol Neutralised : To a suitable quantity of alcohol, add 2 or 3 drops of *phenolphthalein solution* and just sufficient N/10 or N/50 sodium hydroxide solution to produce a faint pink colour. Neutralised alcohol should be freshly prepared when used.

Aluminium Hydroxide : Aluminium hydroxide precipitated and washed free from soluble salts.

Amyl Acetate : $C_7H_{14}O_2$, of Reagent purity.

Benzidine : Paradiaminodiphenyl $(C_6H_4NH_2)_2$, of Reagent purity.

Calcium Oxide : CaO, of Commercial purity.

Capryl Alcohol : $C_8H_{17}OH$, of Reagent purity.

Ceric Sulphate : $Ce(SO_4)_2$, of Reagent purity.

Chloral Hydrate, Solution of : 50 grammes of *chloral hydrate* in 20 millilitres of *water*.

Chlor-Zinc-Iodine : Dissolve 110 grammes of *zinc* in 300 millilitres of *hydrochloric acid* and evaporate to 150 millilitres (sp. gr., about 1·8). Dissolve separately 12 grammes of *potassium iodide* in as little *water* as possible; add 0·15 gramme of *iodine*. Mix the solutions and filter, if necessary, through asbestos.

Chlorine Water : A freshly prepared saturated solution of *chlorine* in *water*.

Citrate Buffer : N/5 *disodium citrate* having a pH value of 5·0.

Cobaltous Chloride : $Co\,Cl_2\text{-}6H_2O$, of Reagent purity.

Cupric Acetate, Solution of : Dissolve 0·1 gramme of *cupric acetate* in about 5 millilitres of *water* to which few drops of *acetic acid* have been added. Dilute to 100 millilitres and filter, if necessary.

Cupric Acetate : $Cu\,(C_2H_3O_2)_2\,H_2O$, of Reagent purity.

Cupric Oxide, Ammoniated : Dissolve 10 grammes of *cupric sulphate* in 100 millilitres of *water*, add sufficient 20 per cent. w/v solution of *sodium hydroxide* to precipitate the copper hydroxide, collect the latter on a filter, and wash free from sulphate with cold *water*. Dissolve the precipitate which must be kept wet during the entire process, in the minimum quantity of *dilute solution of ammonia* necessary for complete solution.

p-Dimethylamino benzaldehyde : $(CH_3)_2\,N\,C_6H_4CHO$, of Reagent purity.

Diphenylamine : $(C_6H_5)_2HN$, of Reagent purity.

Disodium Citrate : $Na_2\,C_6H_6O_7$, of Reagent purity.

Ethyl Acetate : $CH_3COOC_2H_5$, of Reagent purity.

Ethylene-glycol-mono-ethyl-ether : $OH.CH_2.\ CH_2OC_2H_5$, of Reagent purity.

Ferrous Ammonium Sulphate : $Fe(NH_4)_2(SO_4)_2.6H_2O$, of Reagent purity.

Formaldehyde, Freshly Neutralised, Solution of : Titrate the *solution of formaldehyde* with *N/10 sodium hydroxide*, using *solution of phenolphthalein* as indicator, till a very faint pink colour persists.

Fuchsin, Basic : Pararosaniline chloride or acetate, $C_{19}H_{18}N_3Cl$ or $C_{19}H_{18}N_3C_2H_3O_2$, sometimes admixed with the corresponding salts of rosaniline, $C_{20}H_{20}\,N_3Cl$ or $C_{20}H_{20}N_3C_2H_3O_2$.

Glucose : $C_6H_{12}O_6$, of Reagent Purity.

Hydrochloric Acid. sp. gr., 1·125 : Hydrochloric acid B.P. diluted to contain 26 per cent. w/w of HCl.

Kerosine : A mixture of hydrocarbons, cheifly of the methane series, as available in Commerce.

Magnesia Mixture : Dissolve 5·5 grammes of *magnesium chloride* and 7 grammes of *ammonium chloride* in 65 millilitres of *water*, add 35 millilitres of *solution of ammonia*, set the mixture aside for a few days in a well-closed stoppered bottle, and filter. If the solution is not perfectly clear, filter it before using.

Methylene Blue, Solution of : Dissolve 0·18 gramme of *methylene blue* in 100 millilitres of *water*. To 75 millilitres of this solution, add 5 millilitres of *N/10 sodium hydroxide* and 20 millilitres of *water*.

Ortho-Phenanthroline : $C_{12}H_8N_2$. H_2O, of Reagent purity.

Ortho-Phenanthroline, Solution of : Dissolve 0·15 gramme of *orthophenanthroline* in 10 millilitres of a *solution of ferrous sulphate*, prepared by dissolving 1·48 grammes of clear crystals of *ferrous sulphate* in 100 millilitres of *water*. The ferrous sulphate solution must be prepared immediately before dissolving the ortho-phenanthroline. Preserve the solution in well-closed containers.

Phosphotungstic Acid : P_2O_5. $24WO_3$. H_2O, of Commercial purity.

Picrolonic Acid. : $C_{10}H_8N_4O_5$ (1-p-nitro-phenyl-3-methyl-4-nitropyrazolon), of Commercial purity.

Picrolonic Acid, N/10, Solution of : Dissolve 2·64 grammes of *picrolonic acid* in *alcohol* (*95 per cent.*) and make up to 100 millilitres with the same solvent.

Potassium Hydroxide in Ethylene-glycol-mono-ethyl-ether, N/2 : Dissolve 2·8 grammes of *potassium hydroxide* in 100 millilitres of *ethylene-glycol-mono-ethyl-ether*.

Potassium Metabisulphite : $K_2S_2O_5$, of Reagent purity.

Potassium Sulphocyanate : KCNS, of Reagent purity.

Pyridine : C_5H_5N, of Reagent purity.

Quicklime : CaO, of Commerce.

Sand, Ignited : Good quality sand of commerce, digested with *dilute hydrochloric acid* and washed free from all soluble matter. Dry in thin layers and store in a well-closed dry container.

Selenous Acid : H_2SeO_3, of Reagent purity.

Silver Ammonium Nitrate : Dissolve 1 gramme of *silver nitrate* in 20 millilitres of *water*. Add *dilute solution of ammonia* drop by drop, with constant stirring, until the precipitate is almost but not entirely dissolved. Filter and store the solution in dark amber-coloured, well-stoppered bottles.

Sodium Bisulphite : $NaHSO_3$, of Reagent purity.

Sodium Bromate : $NaBrO_3$, of Reagent purity.

Sodium Chloride : NaCl, of Reagent purity.

Sodium Cobaltinitrite : Dissolve 4 grammes of *cobaltous chloride* and 10 grammes of *sodium nitrite* in about 50 millilitres of *water*, add 2 millilitres of *acetic acid* and dilute with sufficient *water* to make 100 millilitres. This reagent must not be kept longer than 3 months. It may be preserved for this length of time by the occasional addition of a few drops of acetic acid.

Sodium Hydrosulphite : $Na_2S_2O_4$, of Reagent purity.

Sodium Nitrate : $NaNO_3$, of Reagent purity.

Starch, Dried : Potato starch of Commerce dried at 100° for two hours.

Starch, Potato : Potato starch of Commerce.

Xylene : C_8H_{10}, of Reagent purity.

APPENDIX II

SOLUTIONS EMPLOYED IN VOLUMETRIC DETERMINATIONS

Ceric Sulphate Solution, N/10, N/50.

Dissolve 42 grammes of *ceric sulphate* in about 500 millilitres of *water* containing 28 millilitres of *sulphuric acid*, warming if necessary. When solution is complete, cool, and add sufficient *water* to make 1000 millilitres and mix well. Standardise the solution as follows :—

Weigh accurately from 0·17 to 0·20 gramme of clean dry reagent iron wire and transfer to a 250 millilitre or a 300 millilitre flask. Add 50 millilitres of *dilute sulphuric acid* and close the flask with a valve-stopper. Prepare a valve-stopper by taking a rubber tubing of convenient diameter and about 5 centimetres in length, place a piece of glass rod in one end, and slip the other end over a glass tube which passes through a perforated stopper of size to fit the flask used. Cut a longitudinal slit about 15 millilitres long in one side of the rubber tube about mid-way of its length. Insert this stopper in the flask and heat on a steam bath until the iron is dissolved. Cool the solution, dilute it with 50 millilitres of freshly boiled and cooled *water*, add 2 drops of *solution of orthophenanthroline* and titrate with the *ceric sulphate* solution from a burette until the red colour is changed to pale blue. Calculate the normality and make exactly N/10 and N/50.

Any other method of equivalent accuracy may be used for standardising the solution of Ceric sulphate.

Ferrous Ammonium Sulphate Solution N/50.

7·843 grammes in 1000 millilitres. Dissolve 8·0 grammes of *ferrous ammonium sulphate* in 100 millilitres of a previously cooled mixture of 20 millilitres of *sulphuric acid* and 100 millilitres of *water*, and dilute with *water* to 1000 millilitres and mix well. Then standardise as follows :—Place an accurately measured volume of 25 to 30 millilitres of the solution in a flask, add 2 drops of *solution of orthophenanthroline* and titrate with *solution of N/50 ceric sulphate* until the red colour is changed to pale blue. From the volume of the *solution of N/50 ceric sulphate* consumed, calculate the normality of the ferrous ammonium sulphate solution.

Potassium Sulphocyanate Solution N/10.

Dissolve 9.717 grammes of *potassium sulphocyanate* in 100 millilitres of *water*.

Sodium Bromate, Standard Solution.

Dissolve 1·525 grammes of Sodium bromate in 100 millilitres of *water*, and make up to 1000 millilitres with *water*.

APPENDIX III

A. DETERMINATION OF ABSORBENCY OF PURIFIED COTTON

Absorbency Test for Purified Cotton. Take five 5-gramme portions of purified cotton from five different parts of the package pulling, not cutting, the samples. Prepare a test basket from copper wire approximately 0·4 millimeter in diameter (No. 26 B. & S.) in the form of a cylinder approximately 5 centimetres in diameter and 8 centimetres deep, with spaces between the wires of approximately 2 centimetres, the basket weighing not more than 3 grammes.

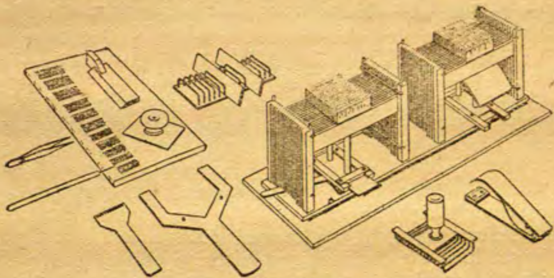
Place 5 grammes of the purified cotton in the basket, and hold the basket on its side approximately 12 millimetres above the surface of *water* at 25°±1°. Allow the basket to drop to the *water* and determine the time in seconds required for complete submersion, using a stop watch.

Remove the basket from the *water* and allow it to drain for 10 seconds in the same horizontal position, then place it immediately in a tared beaker, cover with a tared watch glass, and weigh deducting the weight of the test basket and of the purified cotton to find the weight of water absorbed.

B. DETERMINATION OF FIBER LENGTH OF COTTON

Method

Carry out all operations associated with the determination of fiber length of purified cotton in an atmosphere maintained at 65 per cent., ± 2 per cent., relative humidity at 21°, ± 1·5° (70°F, ±2°F.).



Duplex Cotton Fiber Sorter

Test Apparatus. The sorter (see illustration) consists of two banks of combs rigidly mounted side by side on a common base. Each bank of combs consists of at least 12 individual combs spaced ⅛ inch apart, one behind the other, and mounted in grooves so that as they are approached during the fractionating process and no longer needed, they may be dropped below the working plane. Each individual comb has a single row of accurately aligned and sharply pointed teeth, ½ inch long, consisting of needles 0·015 inch in diameter. The teeth are spaced 62 to the inch, over an extent of approximately 2 inches.

Accessory Equipment. Fibre-sorter forceps, fiber-depressing grid, fiber-depressing smooth plate, and velvet-covered plates. The sorter forceps consist of two brass pieces approximately 3 inches long, hinged on one end and slightly curved to present a beaked aspect at the gripping end for gripping the protruding fibers close to the surfaces of the combs. Usually, one of the gripping edges has a leather or other fibrous padding. The gripping edge is approximately ¾ inch wide.

The fiber-depressing grid consists of a series of brass rods spaced ⅛ inch apart so that they may be placed between the combs to press the fibres down between the teeth. The fiber-depressing smooth plate consists of a polished brass plate approximately 1 by 2 inches, with a knob or handle on the upper surface whereby the plate may be smoothed over the fibers as they are laid on the velvet surface of the array plates. The velvet-covered plates upon which the fibers may be arrayed are aluminium sheets approximately 4 by 9 inches by 3/32 inch thick covered on both sides with high grade velvet, preferably black.

Selection of Cotton. After unrolling the cotton, prepare a representative laboratory test specimen by taking from a package containing from 8 to 16 ounces, 32

pinches (about 75 milligrammes each) well distributed throughout the bulk of the lap, 16 representative pinches being taken from each longitudinal half of the lap. Avoid cotton fibres at the cut ends of the lap, and take particular care to secure portions throughout the thickness of the lap. To avoid biased selection of long or short fibers, all fibers of the group that is pinched must be removed and not allowed to slip from between the fingers.

From packages of not more than 4 ounces in weight, take 8 pinches, and from packages weighing more than 4 ounces and not more than 8 ounces, take 16 pinches, all well distributed.

Mix the pinches in pairs promiscuously and combine each pair by gently drawing and lapping them in the fingers. Then divide each combined pair by splitting longitudinally into two approximately equal parts and utilize one part in the further mixing. (The other part may be discarded or reserved for any further tests or checks.)

Repeat the process described in the preceding paragraph with the successive halves of the bifurcated series until only 1 pinch, the final composite test portion results. Gently parallel and straighten the fibers of the final composite test portion, by drawing and lapping them in the fingers. Take care to retain all of the fibers, including as far as possible those of the neps (specks of entangled fibers) and naps (matted masses of fibers), discarding only motes (immature seed fragments with fibers) and non-fiber foreign material such as stem, leaf, and fragments of seedcoats.

From the final composite portion described in the preceding paragraph, separate longitudinally a test portion of 75 milligrammes, $\pm$ 2 milligrammes, accurately weighed. Retain the residue for any check test if necessary.

The Test. Carefully insert and with the depressor press this weighed test portion into one bank of combs of the cotton sorter, so that it extends across the combs at approximately right angles.

With the sorter forceps grip by the free ends a small portion of the fibers extending through the teeth of the comb nearest to the operator; gently and smoothly draw them forward out of the combs, and transfer them to the tips of the teeth in the second bank of combs, laying them parallel to themselves, straight, and approximately at right angles to the faces of the combs, releasing the gripped ends as near to the face of the front comb as possible. Carefully press with the depressor grid the transferred fibers down into the teeth of the combs. Continue the operation until all of the fibers are transferred to the second bank of combs. During this transfer of the fibers, drop the combs of the first bank in succession when and as all of the protruding fibers have been removed.

Turn the machine through 180° and transfer the cotton fibers back to the first bank of combs in the manner described in the preceding paragraph.

Great care must be taken in evening up the ends of the fibers during both of the above transfers, arranging them as closely as possible to the front surface of the proximal comb. Such evening out of the ends of the protruding fibers may involve drawing out straggling fibers both from the front and rear aspects of the banks of combs, and redepositing them into and over the main bundle in the combs.

Turn the machine again through 180°. Drop successive combs if necessary to expose the ends of the longest fibers. It may be necessary to redeposit some straggling fibers. With the forceps, withdraw the few most protuberant fibers. In this way continue to withdraw successively the remaining protuberant fibers back to the front face of the proximal comb. Drop this comb and repeat the series of operations in the same manner until all of the fibers have been drawn out. In order not to distrub seriously the portion being tested, and thereby vitiate the length fractionation into length groups, several pulls (as many as eight to ten) must be made between each pair of combs.

Lay the pulls on the velvet-covered plates alongside each other, as straight as possible, with the ends as clearly defined as possible, and with the distal ends arranged in a straight line, pressing them down gently and smoothly with the fiberdepressing smooth plate before releasing the pull from the forceps. Not less than 50 and no more than 100 pulls shall be employed to fractionate the test portion.

Group together all of the fibers measuring 12·5 millimetres (about ½″) or greater in length, and weigh the group to the nearest 0·3 milligramme. In the same manner, group together all fibers 6·25 millimetres (about ¼″) or less in length, and weigh in the same manner. Finally, group the remaining fibers of intermediate lengths together and weigh. The sum of the three weights shall not differ from the initial weight of the test portion by more than 3 milligrammes. Divide the weight of each of the first two groups by the weight of the test portion to obtain the percentage by weight of fiber in the two ranges of length.

C. *DETERMINATION OF TENSILE STRENGTH*

Method

Unless otherwise directed, a tensile testing machine should be used in an atmosphere having a relative humidity of 65 per cent., ± 2 per cent., and a temperature of 21°, ±1·1° (70° F, ±2° F.).

Tensile Strength of Surgical Sutures. The tensile strength of surgical sutures is to be determined on a motor-driven tensile strength testing machine using the principle of the constant specimen-rate-of-load, having suitable clamps for holding the specimen firmly. This description applies specifically to that known as the Incline Plane Tester.

The clamp for holding the specimen shall be of the roll type, with a flat gripping surface. The roll shall have a diameter of 0·75 inch, and the flat gripping surface shall be not less than 1 inch in length. The length of the specimen, when inserted in the clamps, shall be 5 inches from nip to nip. When a specimen breaks within 0·5 inch of the nip of the clamp, that reading shall be discarded.

The carriage used in any test shall be of such a weight that when the break occurs, the position of the recording pen on the chart shall be between 20 per cent. and 80 per cent. of the capacity that may be recorded on the chart.

The friction in the carriage must not exceed that which will permit the recording pen to depart from the zero line of the chart at a point not exceeding 2·5 per cent. of the capacity of the chart when no specimen is held in the clamps.

The speed of inclination of the plane of the tester shall be such that it will reach its full inclination of 30° from the horizontal in 20 seconds, ± 1 second, from the start of the test.

The tensile strength of Surgical Gut shall be determined immediately after removal from the tubing fluid, without drying of the specimen.

The tensile strength of Surgical Silk, and of Sterile Surgical Silk that has been packaged dry, shall be determined after the Silk has been conditioned 4 hours in an atmosphere having a relative humidity of 65 per cent., ± 2 per cent., at a temperature of 21°, ±1·1° (70°F., ±2°F.).

When placing the specimen in the jaws of the testing machine, clamp one end of the suture, pass the other end through the opposite clamp, apply a tension of about 1/4 of the required minimum tensile strength of the suture to the free end of the specimen, and close the second clamp. Perform as many breaks as are required in the respective monographs.

D. *DETERMINATION OF DIAMETER OF SUTURES*

Method

The gauge for determining the diameter of sutures shall be of the dead-weight type, equipped with a dial graduated to read directly to 0·001 inch (0·0254 millimetre). The table or anvil of the gauge shall be about 2 inches in diameter. The presser foot shall be circular with a diameter of 0·5 inch ±0·0005 inch (12·7 millimetres, ±0·02 millimetre). The presser foot and moving parts connected therewith shall be weighed so as to apply a total load of 210 grammes, ± 3 grammes (7·4 oz., ± 0·1 oz.) to the specimen.

The presser foot and anvil surfaces shall be plane to within 0·0002 inch and parallel to each other to within 0·0002 inch.

Surgical Gut. Determine the diameter of Surgical Gut immediately after removal from the tube and without stretching. Lay the strand across the anvil in such position as to cross the centre of the anvil and presser foot, and lower the foot until its entire weight rests upon the suture. Determine the diameter of each strand at three quarterly points of its length. At least 2 of the measurements of not less than 10 strands from any lot of 12 tubes shall conform to the required diameter for the size indicated on the label, and at least one measurement of each of the remaining strands shall conform to the requirement. In no case shall any measurement vary more than the required diameter of the size next above or below.

E. *DETERMINATION OF CONGEALING TEMPERATURE*

Method

Unless otherwise directed, place about 10 millilitres of the liquid or 10 grammes of the melted solid to be tested in a dry test tube of 18 to 20 millimetres internal diameter. Then cool in water or in a suitable freezing mixture, the temperature of which should be about 5 degrees lower than the supposed congealing point of the liquid. To induce congelation, rub the inner walls of the tube with the thermometer or add a small solid piece of the substance being tested. By alternate immertion of the tube in the bath, or removal from the bath and constant stirring with the thermometer, the temperature is so adjusted that the greater part of the liquid gradually congeals. The hightes temperature remaining constant for a short time during the congelation is the congealing point.

F. *THE VICAT APPARATUS*

The Vicat Apparatus consists of a frame (D) bearing a movable rod (B) with, at one end, the cap (A) and at the other, one of the following, which are removable : (a) The needle (C) for determining the initial setting time, (b) the needle (F) for determining the final setting time or (c) the plunger (G) for determining the normal consistency.

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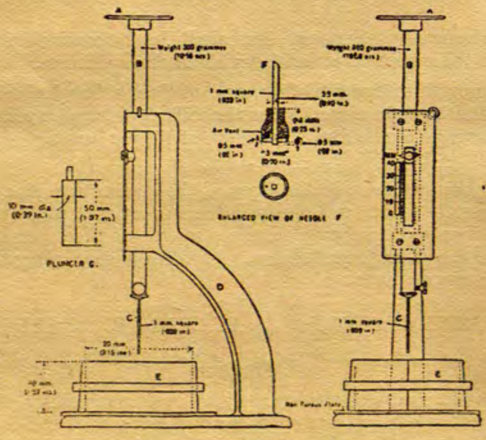


Fig.

The needle (C) shall be 1 millimetre (0·039 in.) square in section and have a flat end. The needle (F) shall be of the same shape and section as needle (C) but

shall be fitted with a metal attachment hollowed out so as to leave a circular cutting edge 5 millimetre (0·20 in.) in diameter, the end of the needle projecting 0·5 millimetre (0·20 in.) beyond this edge. The plunger (G) shall be of polished brass 10 millimetre (0·39 in.) in diameter, 50 millimetre (1·97 in.) long with a projection at the upper end for insertion into the movable rod (B) and the lower edge shall be flat. The movable rod (B) carries an indicator which moves over a graduated scale attached to the frame (D). With all attachments, the cap and rod, with needle (C) or needle (F), or plunger (G), shall together weigh 300 grammes (10·58 oz.).

APPENDIX IV

QUANTITATIVE TESTS FOR HEAVY METALS

Test for Heavy Metals

The Test for Heavy Metals is designed to determine the content of those metallic impurities in substances in the Indian Pharmacopœial List, that are coloured by hydrogen sulphide under the conditions of the test. In chemicals the proportion of any such impurity is expressed as the quantity of lead required to produce a colour of equal depth in a standard comparison solution, this quantity being stated as the limit of Heavy Metals as equivalent parts of lead per million parts of the substance (by weight).

Dilute Acetic Acid. Use *acetic acid Pb T.*

Hydrochloric Acid. All concentrations of hydrochloric acid used in the Heavy Metals Test must be prepared from *hydrochloric acid* and *water.*

Dilute Solution of Ammonia. Use *ammonia solution PbT.*

Solution of Hydrogen Sulphide. Use a freshly prepared saturated solution of *hydrogen sulphide* in cold *water.*

Stock Solution of Lead Nitrate. Dissolve 0·1598 gramme of lead nitrate in 100 millilitres of *water* to which has been added 1 millilitre of nitric acid, then dilute to 1000 millilitres with *water.* This solution contains 1 milligramme of lead in 1 millilitre and must be prepared and stored in glass containers free from soluble lead salts.

Standard Lead Solution. Dilute 10 millilitres of the *stock solution of lead nitrate,* accurately measured, to 100 millilitres with *water.* This solution must be freshly prepared. Each millilitre of this *standard lead solution* contains the equivalent of 0·01 milligramme of lead. When 0·1 milligramme of standard lead solution is employed to prepare the standard to be compared with a solution of 1 gramme of the substance being tested, the comparison solution thus prepared contains the equivalent of 1 part of lead per million parts of the substance tested.

Procedure for Testing Chemicals

Solution A. Introduce into a 50 millilitre Nessler tube, 2 millilitres of *dilute acetic acid,* and exactly the quantity of *standard lead solution* containing the lead equivalent of the heavy metals limit specified for the substance to be tested, and make up to 25 millilitres with *water.*

Solution B. This consists of 25 millilitres of the solution prepared for this test according to the specific directions in each monograph.

Transfer solutions A and B to similar 5-millilitre Nessler tubes, add 10 millilitres of *solution of hydrogen sulphide* to each tube, mix, allow to stand for 10 minutes, then view downward over a white surface; the colour of Solution B is not darker than that of Solution A.

Procedure for Testing Volatile Oils

Shake 10 millilitres of the oil with an equal volume of *water* to which a drop of *hydrochloric acid* has been added, and pass *hydrogen sulphide* through the

mixture until it is saturated : no darkening in colour is produced in either the oil or the water.

APPENDIX V

QUANTITATIVE TESTS FOR ARSENIC

Liquor Chloridorum Trium Isotonicus.

Treat 20 millilitres as described under 'Liquor Ammoniæ Fortis'.	Limit **0·2** part per million.

Calamina Preparata.

Dissolve 0·2 gramme in 14 millilitres of *brominated hydrochloric acid As T.* and 45 millilitres of *water*, and remove the excess of bromine by a few drops of *solution of stannous chloride As T.*	Limit **0·2** part per million.

Amaranthum.

Treat 1 gramme as described under 'Methylthioninæ Chloridum'.	Limit **10** parts per million.

Pectinum.

Add 2 grammes to 10 millilitres of *nitric acid As T.* and 3 millilitres of *sulphuric acid As T.* in a Kjeldahl flask. Heat until dense white fumes are evolved. If the mixture turns brown add more *nitric acid* and heat until colourless or light yellow; cool, add 10 millilitres of water, and 0·5 gramme of *ammonium oxalate As T.* Heat until dense white fumes are evolved; cool and dilute to 25 millilitres. Use 5 millilitres of this solution.	Limit **0·2** part per million.

APPENDIX VI

A. *DETERMINATION OF PEROXIDE VALUE*

Reagents required.

(1) A solvent mixture consisting of *glacial acetic acid* 2 volumes and *chloroform* 1 volume.

(2) *Potassium iodide.*

(3) Approximately 5 per cent. w/v solution of potassium iodide prepared by dissolving *potassium iodide* in freshly boiled and cooled *water*.

(4) 1 per cent. solution of *starch* in *water*.

(5) A strong thick walled test tube about 17 millimetres in diameter and 20 centimetre long, fitted with a rubber cork.

(6) N/500 sodium thiosulphate solution prepared by dissolving 1 gramme of *sodium thiosulphate* and 0·05 gramme of anhydrous *sodium carbonate* in 2 litres of *water* freshly boiled and cooled.

(7) A 250-millilitre conical flask with glass stopper.

METHOD

Weigh accurately about 1 gramme of oil to be tested in the test tube, and then add approximately 1 gramme of solid powdered *potassium iodide*. Run in about 10 millilitres of the solvent mixture washing down any potassium iodide which is adherent to the walls of the tube. Shake the tube to dissolve the oil. Heat the tube over a flame until it boils gently and then hold the tube into a vessel containing boiling water. The liquid rapidly boils and boiling is continued until the froth rises well up the tube (about 20 to 30 seconds is usually necessary). At this point insert a rubber cork, shake vigorously for a few seconds, and cool under a running water tap. Measure about 20 millilitres of 5 per cent. *potassium iodide* solution and pour about 5 millilitres of it into the flask. Remove the cork from the tube and pour the liquid from the tube into the flask. Wash out the potassium iodide from the tube into the flask with the remainder of the 20 millilitres of potassium iodide solution.

Keep the stopper in the flask as much as possible. Pour into the flask about 0·5 millilitre of 1 per cent. *starch* solution ; in the presence of peroxides a brown colour results. Titrate the contents of the flask against *N/500 sodium thiosulphate* shaking thoroughly the whole time. The end point is reached when the brown colour goes and is replaced by the pale straw colour of the oil in emulsion. Read the number of millilitres of *N/500 sodium thiosulphate* used which gives the Peroxide value of the oil.

B. *DETERMINATION OF THE BUTYRO-REFRACTOMETER READING*

Description of the apparatus. The Butyro-refractometer consists of two prisms made of flint glass, the refractive index of which is 1·75, mounted in such a way that they can be opened to admit a drop of oil between the prisms.

The other parts of the instruments are, a telescope with an adjustable eyepiece to focus the engraved scale and an adjustable objective to examine the line of total refraction.

Method of use. The prisms are mounted in a water jacket, in which water is made to circulate generally by the use of a constant temperature device. This water jacket is fitted with a thermometer graduated in 1/10ths. As the question of temperature is of the utmost importance, the water jacket must be brought to 40° and maintained at this temperature.

Open the prisms and clean with a piece of soft linen, moistened with alcohol, and wipe dry.

Place a drop of the melted and filtered oil by means of a glass rod on the surface of the lower prism. Replace the opened lower half of the prism and lock into position.

Adjust the light mirror below the instrument and see that the temperature of the water bath is 40°.

Read off the scale for the whole numbers.

To obtain the first decimal, read the scale, keeping the pointer on the micrometer at zero. Then shift the drum from the zero until the border line coincides with the next lower unit division on the scale. The position of the pointer on the drum gives the decimal to be added.

NOTES. *The Butyro-refractometer is so designed, that using day light and a pure butter fat the borderline should be colourless; if the borderline is bluish or has a coloured fringe it is probable that a vegetable oil is present.*

The instrument should be occasionally standardised against the standard fluid supplied.

Temperature correction. In the case of butter fat this is 0·55 of a scale division for each degree. The scale reading decreases with increased temperature. To

correct the reading to 40°, for every degree centigrade over 40°, 0·55 scale divisions must be added to the reading ; and subtracted from the reading by the same amount for every degree centigrade lower than 40°. This correction is, however, not suitable for other fats and oils. Hence it is always advisable to take the refractive index at 40°, and in noting observations the particular temperature actually used should always be stated.

To convert scale readings into refractive indices, use the following formula :—

$$(n)\,d = 1{\cdot}4220 \pm 0{\cdot}00142 \times (0{\cdot}5753 - \frac{X}{1000})$$, where X=scale readings.

C. *DETERMINATION OF SOLUBLE AND INSOLUBLE VOLATILE ACIDS (REICHERT-MEISSL AND POLENSKE VALUES)*

Reagents required.

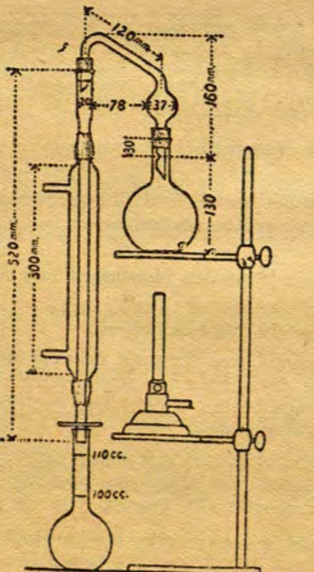
(*a*) *Sodium hydroxide solution.* (1 in 4 W/V). Protect solution from contact with carbon dioxide. Allow solution to settle and use only clear liquid.

(*b*) *Pumice stone.* Heat small pieces to white heat, plunge into *water* and keep there until used.

(*c*) *Glycerol-soda solution.* Add 20 millilitres *solution of sodium hydroxide* to 180 millilitres of pure concentrated glycerol.

Determination

Weigh accurately about 5 gramme of samples to be tested into clean, dry, 300 millilitre flask ; add 20 millilitres of the glycerol-soda solution and heat over flame or asbestos plate until complete saponification occurs, as shown by mixture becoming perfectly clear. If foaming occurs, shake flask gently. Add 135 millilitres of recently boiled *water*, dropwise at first to prevent foaming, then add 6 millilitres



APPARATUS FOR DETERMINATION OF POLENSKE VALUE

of sulphuric acid (1 in 4) and a few fragments of pumice stone. Distil without previously melting the fatty acids, using, apparatus of approximate dimensions illustrated in the figure. Rest flask on a piece of asbestos board having a hole 5 centimetres in diameter in the centre, and so regulate flame as to collect 110 millilitres of distillate in as near 30 minutes as possible and to allow distillate to drop into receiving flask at temperature not higher than 18° to 20°.

When distillation is complete, substitute for receiving flask a 25-millilitre cylinder to collect any drops that may fall after flame has been removed. Mix without violent shaking, immerse flask containing distillate almost completely in water at 15° for 15 minutes, filter the 110 millilitres distillate through dry filter paper 9 centimetres in diameter, and titrate 100 millilitres with the standard *Sodium hydroxide* solution, using *phenolphthalein* (1 per cent., alcoholic solution) as indicator. The pink colour should remain unchanged for 2 or 3 minutes. The *Reichert-Meissl* value is the number of millilitres of *N/10 Sodium hydroxide* solution used multiplied by 1·1, after this result is corrected for figure obtained in blank determination.

Remove remainder of soluble acids from insoluble acids upon filter paper by washing with 3 successive 15-millilitre portions of water, previously passed through the condenser, the 25-millilitre cylinder, and the 110-millilitre receiving flask. Dissolve the insoluble acids by passing successive 15 millilitre portions of neutral alcohol (95 per cent.) through filter paper, each portion having previously passed through the condenser, the 25-millilitre cylinder, and the 110-millilitre receiving flask. Titrate combined alcoholic washings with the *standard Sodium hydroxide solution*, using phenolphthalein as indicator. The *Polenske value* is equal to the number of millilitres of alkali solutions required for the titration.

NOTE. *Unless these directions are followed in every detail as directed, satisfactory results cannot be obtained.*

D. *KIRSCHNER VALUE*

To 100 millilitres of the Reichert-Meissl distillate, in 200 millilitre Erlenmeyer flask, add 6 drops of *phenolphthalein solution* and titrate to very faint pink with a *N/10 Barium hydroxide* solution. Add 0·3 gramme of finely powdered silver sulphate. Shake mixture frequently for one hour and transfer 100 millilitres of filtrate to 300 millilitre flask. Add 10 millilitres of *Sulphuric acid* (1 in 40), 35 millilitres of *water* and a piece of aluminium wire or several small pieces of pumice stone. Distil 110 millilitres in about 20 minutes, using Polenske apparatus. Titrate 100 millilitres of the distillate with *N/10 barium hydroxide* solution, make blank determination, and after correcting number of millilitres of alkali used, calculate the Kirschner value according to the formula, $K = \frac{A \times 121\ (100+B)}{10{,}000}$

in which A=corrected Kirschner titration and B=number of millilitres of standard alkali solution required to neutralise the 100 millilitres of Reichert-Meissl distillate

Butter fat gives Kirschner values from 19 to 26, coconut oil gives an average of 1·9, and palm kernel oil 1·0, whereas the majority of other fats and oils give values from 0·1 to 0·2.

APPENDIX VII

DETERMINATION OF ALDEHYDES IN VOLATILE OILS

(1) OIL OF LEMON GRASS.

Carry out the process described for Oil of Lemon, using about 1 gramme, accurately weighed, of the Oil of Lemon Grass, with 5 millilitres of *benzene* and from 10 to 15 millilitres of *hydroxylamine hydrochloride reagent in alcohol* (*60 per cent.*), according to the aldehyde content of the oil. The volume of *hydroxylamine hydrochloride reagent in alcohol* (*60 per cent.*) used must exceed by 1 to 2 millilitres the volume of *N/2 potassium hydroxide in alcohol* (*60 per cent.*) required. Each millilitre of *N/2 Potassium hydroxide in alcohol* (*60 per cent.*) is equivalent to 0·07667 (0·07606 × 1·008) gramme of citral.

APPENDIX VIII

METHOD OF ESTIMATION OF TOTAL NITROGEN

Nitrates and Nitrites Absent. Weight about 1 gramme of the substance, accurately weighed, in a Kjeldahl flask. Add 10 grammes of powdered *potassium sulphate* or *anhydrous sodium sulphate,* 0·5 gramme of powdered *cupric sulphate,* and 20 millilitres of *sulphuric acid.* Incline the flask at an angle of about 45° and gently heat the mixture, keeping the temperature below the boiling point of the mixture until frothing has ceased. Increase the heat until the acid boils briskly, and continue the heating until the solution has been clear green in colour for 30 minutes. Allow to cool, add 150 millilitres of *water,* thoroughly mix the contents of the flask, and cool again. Add cautiously 100 millilitres of a 30 per cent. aqueous solution of *sodium hydroxide* to form a layer under the acid solution. Add a few pieces of granulated zinc, connect the flask, by means of a Kjeldahl connecting bulb, with a condenser, the delivery tube from which dips beneath the surface of a mixture of 30 millilitres of *N/2 hydrochloric* or *sulphuric acid* and 25 millilitres of *water* contained in an Erlenmeyer flask or a wide-mouth bottle of about 500 millilitre capacity. Mix the contents by gentle rotation, distil until about two-thirds of the contents of the flask has distilled over. Add about 5 drops of *solution of methyl red* to the receiving flask and determine the excess of acid by titration with *N/2 sodium hydroxide.* Run a blank test and make necessary corrections. Each millilitre of N/2 acid consumed is equivalent to 0·007004 gramme of nitrogen.

Nitrates Present. Place a quantity of the substance, accurately weighed, corresponding to about 0·15 gramme of nitrogen, in a Kjeldahl flask, and add thereto 25 millilitres of *sulphuric acid* in which 1 gramme of *salicylic acid* has previously been dissolved. Mix the contents of the flask thoroughly, and allow the mixture to stand for thirty minutes with frequent shaking. Add to the mixture 5 grammes of powdered *sodium thiosulphate* and again mix thoroughly, then add 0·5 gramme of powdered *cupric sulphate* and proceed as directed above beginning with " incline the flask at an angle of about 45°..............of nitrogen ".

When the nitrogen content of the substance is known to exceed 10 per cent., from 0·5 to 1·0 gramme of *benzoic acid* may be added, prior to digestion, to facilitate the decomposition of the substance.

NOTE. *There are certain alkaloids and other nitrogen containing organic compounds that will not yield all of their nitrogen to digestion with sulphuric acid, and this method, therefore, cannot be used for the determination of nitrogen in all organic compounds. In such cases the method may be suitably modified.*

Methods of Micro-analysis of equivalent accuracy may be substituted for this Assay if desired.

APPENDIX IX

A. *PYROGEN TEST*

Test Animal.

Use healthy rabbits weighing 1000 grammes or more which have been maintained for at least 1 week on a uniform diet and have not lost weight. Test the thermometer to determine the time required to reach maximum temperature. If the animals have not been previously used for such tests, take four rectal temperature readings on each of the animals at 2-hour intervals for 1 to 3 days before use. Insert the thermometer beyond the internal sphincter and allow it to remain a sufficient time to reach maximum temperature, but in no case less than 90 seconds, before the reading is recorded. Discard those animals with a temperature in excess of 39·8°. On the day of the test take a control temperature reading before the injection of the test material. Animals may be used for the test and in subsequent tests after a rest period of not less than 2 days, provided the control temperature reading taken on the day of the test does not exceed 39·8°. The reading taken on the test day constitutes the normal temperatue of the test animal from which a subsequent rise due to the injection of the test material

is calculated. Keep test animals in individual cages protected from disturbances likely to cause excitement. Exercise particular care to avoid exciting the animals on the day of taking the control temperatures and on the test day. Withhold food from any animal used, beginning 1 hour before the first temperature reading, and permit no food until the day's record is completed. Free access to water is allowed. Keep the animals at uniform temperatures (± 5°) during the control and test period. They should preferably be housed in quarters maintained at constant temperature and humidity.

Suggested details of the method.

Warm the product to be tested to approximately 37° and inject 10 millilitres per kilogramme of rabbit, intravenously through the marginal ear vein within 15 minutes subsequent to the control temperature reading on the day of the test. Record the temperature 1 hour subsequent to the injection and each hour thereafter until three readings have been made. Syringes and needles used for these injections must have been treated to render them pyrogen-free and then sterilised. No less than five rabbits shall be used for each test and the test shall be considered positive if three or more of the five animals show an individual rise in temperature of 0·6° or more above the normal established for each of these animals. If only one or two of the five animals show a positive response the test must be repeated on a second group of five additional animals. The test shall be considered positive if two of the second group of five animals show an individual rise in temperature of 0·6° or more above the normal established for these animals.

B. *BIOLOGICAL ASSAY OF COBRA AND VIPER VENOMS.*

B. I. Biological Assay of Cobra Venom.

CAUTION.—*In any part of India in which Cobra Venom is controlled by law, care must be taken that the provisions of such law are duly complied with (See page ix).*

Method of Assay.—White mice weighing between 18 and 20 grammes are used for the purpose, at least 10 mice being used for each test. The required quantity of cobra venom dissolved in 0·5 millilitres of sterile physiological saline is injected intravenously in each mouse. The quantity (in milligrammes) which will kill, in 2 to 24 hours, not less than 3 and not more than 8, out of the 10 mice so injected represents one mouse unit.

B. II. Biological Assay of Viper Venom.

CAUTION.—*In any part of India in which Viper Venom is controlled by law, care must be taken that the provisions of such law are duly complied with (See page ix).*

Method of Assay.—White mice weighing between 18 and 20 grammes are used for the purpose, at least 10 mice being used for each test. The required quantity of viper venom, dissolved in 0.5 millilitres of sterile physiological saline is injected intravenously in each mouse. The quantity (in milligrammes) which will kill, in 2 to 24 hours, not less than 3 and not more than 8, out of the 10 mice so injected represents one mouse unit.

C. *BIOLOGICAL ASSAY OF PLAGUE VACCINE.*

Test Animal. Use white mice, weighing 22-28 grammes, of a strain susceptible to plague infection. The selected strain of mouse should be such that an infective dose of 6—12 micro-organisms of a virulent strain of *Pastuerella pestis* per animal given subcutaneously should produce a mortality of not less than 80 per cent. of the animals used.

SUGGESTED DETAILS OF THE METHOD.

A. Test Infective Dose :

(1) *Selection of Suitable virulent strain of Pastuerella pestis.* Only such strains of the micro-organism should be selected as produce a mortality of not less than 80 per

cent. among mice of a suitable strain with a test infective dose of 6-12 micro-organisms. For this purpose, primary cultures from severe septicaemic human cases are obtained by planting venous blood on agar slopes. After four days' growth at room temperature (27° to 32°), they are tested for purity. After a culture is adjudged to be pure, a 2 mm. loopful is seeded in 10 ml. broth in a test tube with an internal diameter of approximately 17 mm. and incubated at 28° for 48 hours. From this, a second broth subculture is made by inoculating 0.5 ml. into 9.5 ml. of broth contained in a test tube with an intermal diameter of approximately 17 mm., and incubating it at 28° for exactly 48 hours. Such a culture contains in 1 millilitre 300 million to 600 million micro-organisms. Suitable dilutions in broth are made and virulence tested. 0.2 ml. of dilution 10^{-7} containing 6-12 micro-organisms is used as the test infective dose per animal. Those strains of the micro-organism which produce a mortality of 80 per cent. among the animals used with this test infective dose are adjudged to be virulent. Such strains of the micro-organism are subcultured on rabbit blood agar (5 per cent.) and stored at $4° \pm 2°$ for future use, or are preserved by drying from the frozen state. Agar cultures stored in the cold strain retain their virulence for about 3 years. Method of preserving by drying from the frozen state gives better results, the virulence is maintained much longer, probably indefinitely.

(2) *Standard test infective dose.* For testing the protective power of a vaccine ten times the test infective dose of the selected strain of organism of proved high virulence is given per animal subcutaneously. 0.2 c.c. of a 10^{-6} dilution of the 48-hour growth in broth described above contains 60 to 120 organisms and forms the standard test infective dose.

B. Measurement of the Protective Power :

(1) *Principle.* The determination of the minimum amount of a given plague vaccine that will protect half the mice immunised with it against the standard test infective dose.

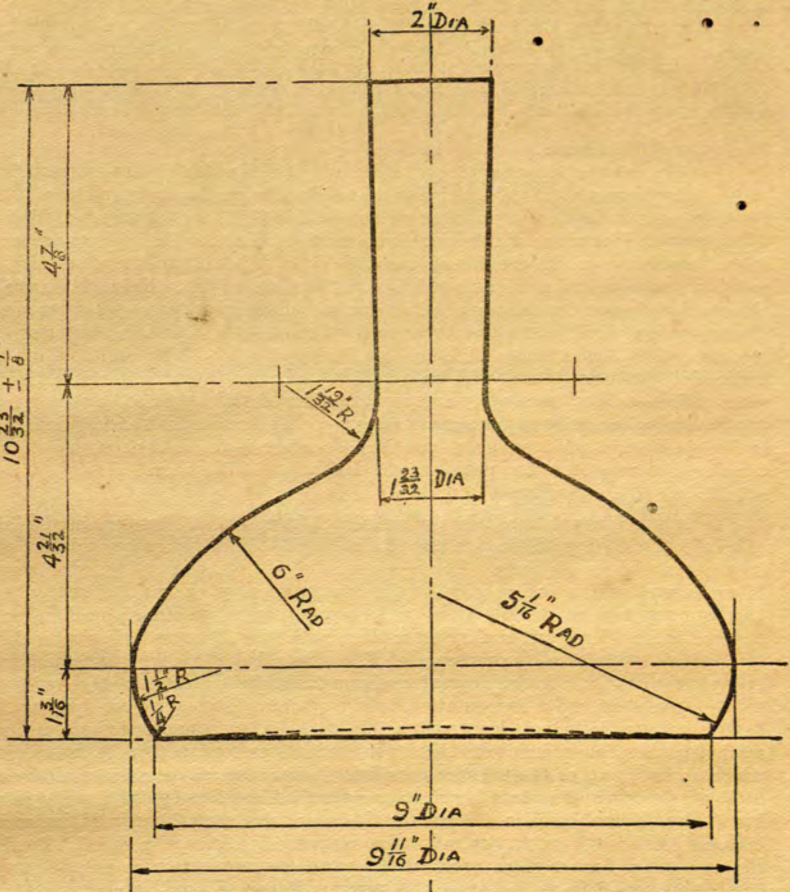
(2) *Method.* For any given vaccine five graded doses or more are decided upon after a preliminary test, so that the 50 per cent end-point protective dose lies about the middle of the selected series. For each dose a batch of six mice is used, and the selected doses are given in two halves with an interval of seven days. Then seven days after the giving of the second half of the dose of the vaccine the standard test infective dose is given. Both the vaccine and the test infective dose are given subcutaneously. It is advantageous to give each injection at a different part of the abdominal wall.

The mice are observed for 25 fiays after the administration of the standard test infective dose. During this period any animals that die are post-mortemed, signs of plague are looked for, and splesmear examined. If plague organisms are not seen (which is exceedingly rare) heart blood is cultured. If plague organisms are still not found, the death is noted in the protocol and a note is made that it was not due to plague. Such deaths are very rare, usually all the deaths due to plague occur by the 15th day after the indication of infection. At the end of the period of observation (25 days) all the remaining mice are killed and examined for plague.

For each test 10 mice are used as controls and they are given the standard test infective dose at the same time as it is given to immunised mice. All these control mice usually die by the 9th day, and are similarly examined.

This determination is repeated to avoid odd results.

(3) *Evaluation of the results.* From the results of these two determinations, the 50 per cent. end-point is calculated by a suitable statistical method. A suitable plauge vaccine should have a minimum mouse protective dose of 0.004 ml. or less.



3-LITRE HAFFKINE FLASK FOR BIOLOGICAL ASSAY OF PLAGUE VACCINE
(Courtesy Messrs James A. Jobling & Co.)

D. BACTERIOLOGICAL EXAMINATION OF GELATIN

Preparation of Sample.

Employ aseptic conditions thoroughout. Use preferably a powdered sample. If the gelatin is in sheets, flakes, or shreds, grind the latter under aseptic conditions through a sterile grinder into a sterile bag or other sterile container. After mixing thoroughly, weigh 5 grammes of the powdered sample, and place it in a sterile dilution bottle containing 95 millilitres of sterilised *water*. After the gelatin is thoroughly wetted, place the container in a water bath, heated to between 40° and 45°. When the contents become uniformly heated, shake well until solution is complete.

Dilution.

Dilute 20 millilitre of this freshly preapared 1 in 20 solution with 80 millilitres of sterilised *water* to make a 1 in 100 solution. By decima dilution prepare 1

in 1000 and 1 in 10,000 dilutions of the dissolved gelatin. If the gelatin is known to be of good quality, the 1 in 20 and 1 in 100 dilutions will suffice. The additional weaker solutions are to be made for gelatin samples known or thought to possess a high bacterial content. Shake each dilution vigorously at least twenty-five times before a second dilution is made from it or before a sample is removed for plating.

Plating for Total Count.

Use sterile pipettes graduated to deliver 1 millilitre, and glass-covered Petri dishes 10 centimetres in diameter and 15 millimetres in depth for plating.

Plate out in duplicate 1 millilitre each of the 1 in 20, 1 in 100, and other dilutions if necessary. Plating should be done immediately after the dilutions are prepared. Place 1 millilitre of the dilution in a sterile Petri dish, add to the Petri dish 10 millilitres of liquefied nutrient agar at a temperature of 40°. Raise the cover of the Petri dish just enough for the introduction of the pipette or culture medium. Flame the lips of all flasks, test tubes, and other containers used in delivering the medium. Mix the contents of Petri dish thoroughly by tilting and rotating the dish. All plates are to be solidified as quickly as possible and, after inverting all glass-covered plates, incubate them for 72 hours at 37°. Count by preference the plates having between 30 and 300 colonies. Enumerate and express results in terms of bacteria per gramme of gelatin. Counting is to be done with a lens of 2·5 diameter magnification, with a focal distance of 3·5 inches.

Presence of Escherichia coli.

Inoculate fermentation tubes containing litmus lactose bouillon in duplicate or triplicate with 1 millilitre portions of the 1 in 100 freshly prepared dilution, and incubate at 37° for 48 hours. Examine each tube at the end of 24 and 48 hours. If gas is produced in one or more of the fermentation tubes, make streak cultures therefrom as soon as possible after gas formation occurs, on Endo's medium or on eosinmethylene blue agar, and incubate these at 37° for 24 hours. Typical colonies are positive evidence of the presence of *E. coli* in a 1 in 100 dilution of the gelatin under examination. Transfer organisms from at least two of this typical colonies each to an agar slant and a fermentation tube containing litmus lactose bouillon. If typical colonies have not developed within 24 hours on Endo's medium or eosin-methylene blue agar, incubate the inoculated plates for another 24 hours, after which at least two of the colonies considered most likely to be species of the *coli-aerogenes* group are transferred each to an agar slant and fermentation tube containing litmus lactose bouillon. Incubate the agar slants at 37° for 24 hours and examine the growth microscopically after staining by Gram's method. Incubate the inoculated fermentation tubes at 37° until gas production is noted, but the incubation period is not to exceed 48 hours. Report *E. coli* as absent in the 1 in 100 dilution of gelatin inoculated in the orginal fermentation tubes if gas is not produced after 48 hours of incubation at 37°. If gas is produced, *E. coli* is reported as being present if the confirmatory evidence is positive and *E.coli* is reported as being absent if the confirmatory tests are negative. Positive confirmatory evidence is the formation of gas in litmus lactose bouillon from colonies on Endo's medium or on Eosin-methylene blue Agar and the demonstration of Gram-negative, non-spore forming bacilli in the agar cultures.

CULTURE MEDIA

Endo's Medium.

Lactose	10 grammes
Dibasic Potassium Phosphate	3·5 grammes
Sodium Carbonate, anhydrous	1 gramme
Basic Fuchsin	0·5 gramme
Sodium Bisulphite	2·5 grammes
Alcohol	5 millilitres
Distilled Water	35 millilitres
Nutrient Agar (need not have been sterilized, but if not sterile must be freshly prepared)	960 millilitres

Dissolve the *lactose* and the *dibasic potassium phosphate* in the hot liquefied nutrient agar, the *sodium carbonate* in 10 millilitres of *water*, the *basic fuchsin* in the *alcohol*, and the *sodium bisulfite* in 25 millilitres of *water*. Add the sodium carbonate solution, the fuchsin solution, and the sodium bisulfite solution to the nutrient agar solution, mixing well after each addition. Place in suitable containers, and sterilize by moist heat at 100° or by any other adequate and suitable method.

Endo's Medium has a red or pink colour when hot, which becomes a faint flesh colour or disappears upon cooling. It has a hydrogen-ion concentration equivalent to a pH of 7·6 to 8·0. It is preferable to prepare Endo's Medium freshly as needed as it deteriorates upon standing, especially if exposed to light.

Eosin-Methylene-Blue Agar.

Peptone	10 grammes
Dibasic Potassium Phosphate	2 grammes
Agar, finely shredded	15 grammes
Lactose in sterile 20 per cent. aqueous solution	50 millilitres
Eosin in 0·2 per cent. aqueous solution	20 millilitres
Methylene Blue in 0·5 per cent. aqueous solution	20 millilitres
Distilled Water	1000 millilitres

Dissolve the *peptone, dibasic potassium phosphate* and *agar* in the distilled water by heating in an autoclave for 15 minutes at 15 pounds pressure or by boiling in a water bath. Replace any of the water lost by heating. Adjustment of the pH and filtration of the medium are not required. Place 100 millilitres quantities in flasks and sterilize by heating in an autoclave for 15 minutes at 15 pounds pressure (121·5°).

Just prior to use liquefy the medium by means of heat and to each flask containing 100 millilitres, add 5 millilitres of the *lactose* solution, 2 millilitres of the eosin solution, 2 millilitres of the methylene blue solution, and mix well.

Litmus Lactose Bouillon.

Extract of Beef	3 grammes
Peptone	10 grammes
Lactose	10 grammes
Distilled Water, a sufficient quantity, to make	1000 millilitres

Litmus Solution, a sufficient quantity.

Dissolve the extract of beef, the *peptone*, the *sodium chloride*, and the *lactose* in 975 millilitres of *water* by the aid of heat; add sufficient *normal sodium hydroxide* to bring the hydrogen-ion concentration to pH 7·4, or 0·2 higher than the pH desired in the finished broth, and filter. Add sufficient litmus solution to give a faint blue tint. Add sufficient *water* through the filter to make 1000 millilitres. Sterilize by moist heat at 100°.

Sodium Chloride, 5 grammes per 1000 millilitres, may be added to this medium if preferred.

Litmus Solution.

Litmus, powdered	25 grammes
Alcohol.	
Distilled Water, each, a sufficient quantity.	

Extract the litmus with three successive portions of 100 millilitres each of boiling *alcohol*, continuing each extraction for about one hour. Filter, wash with *alcohol*, and discard the alcoholic solutions. Digest the residue with about 25

millilitres of cold *water*, filter, and discard the filtrate. Finally extract the residue with 25 millilitres of boiling *water*, cool and filter.

Litmus turns red with acids and blue with alkalies. The pH range is from 4·5 to 8·3. Preserve litmus solution in wide-mouthed containers, stoppered with loose plugs of purified cotton.

Nutrient Agar.

Agar, finely shredded	15 grammes
Peptone	5 grammes
Extract of Beef	3 grammes
Distilled Water	1000 millilitres

Normal Sodium Hydroxide, a sufficient quantity.

Dissolve the agar in 800 millilitres of *water* by means of heat. Dissolve the peptone and extract of beef in 200 millilitres of *water*. Mix the two solutions. Add sufficient *normal sodium hydroxide* to bring the hydrogen-ion concentration to pH 7·2, or to 0·2 higher than the pH desired in the finished medium. If clarification is desired, filter the medium while hot through cotton enclosed in gauze into suitable containers. Sterilize in an autoclave for 20 minutes at 15 pounds pressure (121·5°),

Sodium Chloride, 5 grammes per 1000 millilitres, may be added to this medium, if preferred.

E. PRESSOR ASSAY METHOD IN 'SPINAL' ANIMALS

(i) *Preparation of the Solution for the Test.* Weigh accurately about 0·050 gm. of standard adrenaline, dissolve it in 5 millilitres of *N/10 hydrochloric acid* and dilute this to 50 millilitres by the addition of *water*, thus making a 1 in 1,000 solution. This solution must be recently prepared, otherwise it deteriorates. It will keep for a short time if preserved in hard glass containers in a refrigerator, but it must be discarded if any signs of deterioration, such as discolouration, are observed.

(ii) *Standard Preparation.* The standard preparation is a quantity of Adrenaline B.P. which satisfies all the tests for purity specified in the British Pharmacopœia. The optical rotation of a 4 per cent. w/v solution of Standard Adrenaline in *N/1 hydrochloric acid*, should lie between —50 to —53 degrees.

Suitable dilutions of the standard Adrenaline solutions may then be made in physiological saline for comparison with an equivalent dilution of Liq. Adrenaline Hydrochlor to be tested.

(iii) *Methods of Comparison of Potency.* Either of the following methods may be adopted :—

(A) For the purpose of the assay a full grown cat, preferably male, should be used. The cat should be anaesthetised with a suitable anaesthetic, the spinal chord should be divided and the brain destroyed, the respiration being maintained artificially. The blood pressure is estimated by inserting a cannula into the carotid artery, and connecting the same with a mercury manometer which records on a moving drum. The injections are made into the exposed femoral vein. The blood-pressure must be low and must not vary before experiments are started.

Determine the amount of standard solution necessary to cause a sub-maximal rise in blood-pressure by injecting intravenously varying doses of the solution at regular intervals and after a satisfactory dose has been ascertained, the uniformity of reaction should be tested by the injection of two or more doses of equal size. If these injections produce approximately equal increases in blood-pressure, alternate injections of the solution to be tested and of the standard are made changing the amount of the unknown until two or more successive injections raise the blood-

pressure to the same height, indicating that the amount of active agent is the same in the doses used. From the results thus obtained, the strength of the unkown solution may be determined and adjusted.

(B) For the purpose of the assay, a dog of medium size should be used. The animal should be anaesthetised with a suitable anaesthetic and maintained under artificial respiration. It is prepared for blood-pressure estimations by inserting a cannula into the carotid artery and connecting the same with a mercury manometer which records on a moving drum. The injections are made into the exposed femoral vein. Before the test is made, in case any muscular movement such as twitching is present, the dog should receive by intravenous injection a sufficient dose of curare, but if the animal is deeply anaesthetised, this is not necessary. The dog should also receive a sufficient dose of atropine sulphate (from 0·001 gm. to 0·002 gm.) to paralyse the vagi, this paralysis being proved by electrical stimulation. Injections must be made at regular intervals of approximately five minutes.

Determine the amount of standard solution necessary to cause a rise in blood-pressure from 30 to 60 millimetres of mercury by injecting intravenously varying dose of the solution and after a satisfactory dose has been ascertained, the uniformity of reaction should be tested by the injection of two or more doses of equal size. If these injections produce approximately equal increases in blood-pressure, alternate injections of the solution to be tested and of the standard are made varying the amount of the unknown until two or more successive injections raised the blood-pressure to the same height, indicating that the amount of active agent is the same in the doses used. From the results thus obtained, the strength of the unknown solution may be determined and adjusted.

APPENDIX X

STERILITY TESTS FOR SOLIDS

MATERIALS REQUIRED.

1. **Broth for Sterility Tests under Aerobiosis.**

Beef steak (free from fat, tendons, and bone)	500 grammes
Peptone	10 grammes
Sodium Chloride	5 grammes
Dextrose	10 grammes
Distilled Water, sufficient to produce	1000 grammes

Grind the meat. Add 1000 millilitres of *water*; mix well and keep cold in a refrigerator for 18 to 24 hours. Remove, with a piece of absorbent cotton, any scum of fat which may be present. Then strain through cheese cloth and squeeze the meat as dry as possible, the amount of fluid recovered should almost equal the amount of *water*, added. Alternative method: thoroughly mix the beef with the *water*, heat at 100° for 1 hour, strain through cheese cloth, and press the meat as dry as possible.

Dissolve the peptone, sodium chloride, and dextrose in the liquid obtained by either method. Add sufficient *normal Sodium hydroxide* so that the preliminary reaction, after diluting with *water* to 1000 millilitres, is pH 7·6. Filter through a wet filter paper until clear, distribute it in quantities of 40 millilitres each in chemically-clean, preferably, sterile test tubes (approximately 25 millimetres by 200 millimetres); plug these with gauze-wrapped, non-absorbent cotton and sterilise in an autoclave at 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes, or by any other suitable method. The final reaction should be between pH 7·2 and pH 7·4.

Do not use culture medium which has been kept longer than 2 weeks at room temperature or 4 weeks under refrigeration.

2. Broth for Sterility Tests under Anaerobiosis.

Litmus Solution	10 millilitres
Gelatin	20 grammes
Broth for Sterility Tests under Aerobiosis, a sufficient quantity to produce .	1000 millilitres

The "broth prepared for aerobiosis" need not be filtered or sterilised before the addition of the other ingredients. Dissolve the gelatin in the broth with the aid of gentle heat, add the solution of litmus and adjust the preliminary reaction to pH 7·6. Then, if necessary, add the albumen, of two fresh eggs or its equivalent in desiccated egg albumen, heat to coagulate and add *water* to make 1000 millilitres; filter until clear and distribute the filtrate in quantities of 40 millilitres each, as described under the broth for testing aerobic organisms. Sterilize in an autoclave at from 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes, or by any other suitable method. The final reaction should be between pH 7·2 and 7·4.

The 10 millilitres of solution of litmus may be replaced by 0·2 gramme of azolitmin, if preferred.

Do not use culture medium which has been kept longer than 2 weeks at room temperature or 4 weeks under refrigeration.

3. Honey Medium for Moulds and Yeasts.

Peptone	10 grammes
Honey	60 millilitres
Distilled Water, a sufficient quantity to produce	1000 millilitres

Dissolve the peptone in the *water* with gentle heat, add the honey, and adjust the preliminary reaction to pH 6·0. Filter, if necessary, and sterilise in an autoclave at 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes or by any other suitable method. The final reaction should approximate pH 6·6.

4. Sterilised Distilled Water.

Distribute distilled water in quantities of 40 millilitres each in chemically clean, preferably sterile, test tubes. Plug the tubes with gauze-wrapped, non-absorbent cotton, and sterilise by *heating in an autoclave.*

5. Inactivating Fluids for Inactivating Bacteriostatic Agents.

Fluids A and B are used for removing the various chlorine, iodine, or mercury compounds which are employed as bacteriostatic agents in the tubing fluids used in the packaging of sutures. Fluid C is necessary as a preliminary inactivating fluid if the chemical analysis shows that the sutures contain copper salts. If bacteriostatic agents, other than those above designated are used, appropriate sterile inactivating fluids and appropriate sterile washing agents must be employed so as to remove effectively the bacteriostatic and inactivating agents, which if present would interfere with bacterial growth in the subsequent test for sterility.

6. Inactivating Fluid A.

Sodium Thiosulphate	10 grammes
Sodium Carbonate	10 grammes
Distilled Water, a sufficient quantity to produce	1000 millilitres

Mix, filter if necessary, and distribute in quantities of 40 millilitres each, in chemically-clean, dry, sterile test tubes. Sterilise in an autoclave at 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes.

7. Inactivating Fluid B.

Sodium Thiosulphate	100 grammes
Distilled Water, a sufficient quantity to produce	1000 millilitres

Mix, filter if necessary, and distribute in quantities of 40 millilitres each, in chemically-clean, dry, sterile test tubes. Sterilise in an autoclave at 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes.

8. Inactivating Fluid C.

Ammonium Chloride	50 grammes
Strong Solution of Ammonia	15 millilitres
Distilled Water, a sufficient quantity to produce	1000 millilitres

Dissolve the ammonium chloride in enough *water* to make 1000 millilitres, filter if necessary, and sterilise in an autoclave at 15 to 20 pounds pressure (121·5° to 126·5°) for 20 to 30 minutes. Add 15 millilitres of a strong solution ammonia and distribute the solution aseptically in quantities of 40 millilitres each, in chemically-clean, dry, sterile test tubes.

9. Petrolatum-Paraffin Mixture for an Anaerobic Seal.

Petroleum, having a melting point of 48° . .	50 grammes
Paraffin, having a melting point of 57° . . .	50 grammes

Liquefy the ingredients by gentle heat, mix, and distribute, preferably in quantities of 50 or 100 millilitres each, in chemically clean, dry test tubes or other containers. Sterilise in a hot air oven at 170° for 2 hours or by any other suitable method.

Suggested Details of Method.

Carry out all bacteriological tests under the most rigid aseptic conditions. Wherever possible, tests should be carried out by two operators working together. The outside wearing apparel of the operators should consist of sterile caps, gowns, and face masks to cover the nose and mouth, and all manipulations should be conducted in a small, dust-proof room supplied with filtered air under positive pressure. The air in the testing room should be sprayed with water and the room itself washed with a disinfectant each time transfers are to be made, or at least once daily when in use, the room being allowed to remain closed for 15 minutes thereafter.

Opening of Packages and Containers.

For Purified Cotton, Gauze, Surgical Dressings, and Related Products. Flame with care the carton, package, container, or one of the margins if in a envelope to remove adhering dust particles. Remove material from the package with sterile forceps. Sterilisation of the latter is effected in an autoclave or by wrapping the forceps and heating them in a hot-air oven at 170° for 2 hours. Between successive transfers thoroughly flame the forceps. If scissors are needed, sterilise them by the technique directed for forceps.

For Sutures. If necessary, make a file line in the centre of the tube or about 10 millimetres above any tubing fluid. Then place the tubes in a suitable, active

disinfecting solution for 24 hours. Remove the tubes with sterile forceps and place them between sterile towels. As an alternative method of sterilisation, flame the tubes, preferably in a wing flame avoiding the heating of the contents.

Removing and Culturing Contents. Take portions of the substance in triplicate from the cartons, wrapped-packages, envelopes, and similar containers. The material to be tested should be taken from various lactations within the roll of purified cotton, gauze, surgical dressing, or related material, preferably from the other end, centre, and core, using sterile instruments and equipment. Transfer these portions of the material, as rapidly as possible, to the necessary number of tubes of medium for aerobic and anaerobic culturing, and also to tubes of honey medium for detecting moulds and yeasts. Before use, heat the culture medium for anaerobiosis at 100° for 15 minutes and cool quickly. Seal the inoculated anaerobic medium with a thick (3 centimetres) layer of sterile petrolatum-paraffin mixture. Place the sealed tubes immediately in a 37° incubator or in a cool water bath to solidify the seal. The time between the removal of the medium from the steam bath and the pouring of the seal should not exceed 15 minutes when examining sutures, and 30 minutes when examining other solids. Cultures of sutures are incubated at 37° for 15 days before negative results are recorded. Other products are to be incubated as directed above for 7 days before negative results are recorded. The cultures in honey medium for yeast and fungi are to be incubated for 15 days at 22° to 25° before negative results are recorded.

In the case of sutures, break the tube at the filed line preferably by holding against it a red-hot, curved wire. Transfer the entire suture or loop or strand of gut, with the points of the sterile forceps, to the test tube containing 40 millilitres of sterile distilled water, replace the cotton plug, and incubate the tube at 37° for 24 hours. Then transfer the gut to a test tube containing 40 millilitres of sterile inactivating fluid A, using the necessary precautions to prevent contamination, and again incubate at 37° for 24 hours.

If a chemical analysis of at least four sutures of any lot reveals that the sutures are impregnated with more than 2 per cent. of a mercury compound or more than 5 per cent. of chlorine or iodine compounds, use sterile inactivating fluid B instead of the above. If the sutures upon chemical analysis have been found to contain copper, transfer the suture, after treatment with 40 millilitres of sterile distilled water, to 40 millilitres of sterile inactivating fluid C and again incubate at 37° for 24 hours.

It may also be necessary to employ other appropriate sterile inactivating fluids if bacteriostatic agents other than mercury, iodine, or chlorine compounds have been used. If inactivating fluid B or inactivating fluid C, or special inactivating fluids are used, followed by placing the suture in 40 millilitres of sterile inactivating fluid A. That the inactivating fluid used may not interfere with bacterial culturing, an additional step is necessary before the transfer of the suture to the culture medium. This is to wash the suture, after treatment with the inactivator, in another tube of 40 millilitres of sterile *water*. Finally, place the suture in each of the three tubes of medium to test for aerobes, anaerobes, and for moulds and yeasts as detailed above.

Confirm all positive cultures showing growth, by a microscopic examination of stained smears.

At the end of the period of incubation inoculate at least 5 per cent. of all negative aerobic suture cultures showing no growth, with 1 millilitre of a 1 to 100,000 dilution of an 18- to 24-hour broth-culture of *E. coli* and incubate at 37° for 3 days. Inoculate at least 5 per cent. of all negative anaerobic suture cultures showing no growth with 1 millilitre of a 1 to 100,000 dilution of an 18 to 24 hour broth-culture of *C. novyi* and incubate at 37° for 3 days. Inoculate at least 5 per cent. of all negative yeast and mold suture cultures showing no growth, with 1 millilitre of a 1 to 1000 dilution of a 72-hour honey medium culture of *Monilia albicans* and

incubate at from 22° to 25° for 3 days. Failure of growth is evidence that bacteriostatic agents which may have been carried over in the transfer are present.

CONTROLS

Tubes of media, *water*, and inactivating fluid are preferably placed in cans or baskets before sterilisation and then covered by paper hoods. Incubate all tubes of culture media immediately after their preparation, for 48 hours at 37° and then for 48 hours at room temperature. Discard tubes showing growth. Culture accurately and also anaerobically 10 millilitres of the *water* used in these tests and also each of the inactivating fluids, immediately after their preparation. If any of the tubes used in testing show growth the entire stock of material they represent must be discarded.

When testing any material for sterility, the following controls are to be conducted simultaneously :—

(*a*) Inoculate two tubes of wash of the culture media to be used with 10 millilitres of the *water* used and incubate for 15 days.

(*b*) Carry out a similar test as in (*a*) but replace the *water* with the inactivating fluid used. If more than one inactivating fluid is to be employed, each one must be tested separately.

(*c*) Seal two tubes of the anaerobic culture medium with a 3-centimetre layer of the petrolatum paraffin mixture and incubate for 15 days to determine the sterility of the anaerobic seal.

(*d*) The culture medium to be used for anaerobic culturing should support growth upon inoculating 40 millilitres with 1 millilitre of 1 to 100,000 dilution of an 18- to 24-hour broth-culture of *C. novyi*. The culture medium to be used for aerobic culturing should support growth upon inoculating 40 millilitres with 1 millilitre of a 1 to 100,000 dilution of *E. coli*. Incubate inoculated tubes for 72 hours at 37°. The culture medium used for moulds and yeasts should support growth upon inoculating 40 millilitres with 1 millilitre of a 1 to 1000 dilution of a 72-hour honey medium culture of *Monilia albicans* and incubating at 22° to 25° for 3 days.

APPENDIX XI

TESTS FOR FREEDOM FROM ABNORMAL TOXICITY

(1) Protein Hydrolysate, Normal Human Serum and Citrated Normal Human Plasma.

(*a1*) 7 millilitres, per kilogram body weight, injected intravenously into rabits do not show any reaction.

(*a2*) The injection should be repeated after 7 days when no reaction, *e.g.*, rise of temperature above 3°F, tremors, convulsion, death, etc., should occur.

(*b*) In a healthy cat, which has been previously anaesthetised with a suitable anaesthetic, and in which the respiration is maintained artificially, an amount of blood equal to about 1 per cent. of body weight is removed from an artery to bring the animal to a moderately low condition. This condition is indicated by a fall of blood pressure to about one-half to one-third of the original level. The material is transfused at this stage through a vein at an uniform rate, the volume transfused being equal to that of the blood let out. The injection should not produce any untoward reaction or cause the death of the animal. The blood pressure is usually well maintained or shows a slight rise during and after transfusion.

(2) Urea Stibamine.

Test on Mice. 2 per cent. w/v solution of the sample being tested is prepared in freshly boiled *water*. This solution is given by intravenous injection to mice weighing not less than 13 grammes and not more than 15 grammes, each mouse receiving 200 to 250 milligrammes per Kilogramme of body weight. Ten mice

are first injected and if not more than two die within three days, the sample passes the test. If more than two mice die, a second series of ten mice receive similar injections. If the number of deaths in this second series within three days, when added to the number of deaths in the first series, is not greater than eight, the sample passes the test. If, however, the number of deaths in the two series is greater than fifteen, the sample fails to pass the test. If the number of deaths in the two series is greater than eight but less than fifteen, a third series of ten mice receive similar injections. If the number of mice which die in the three series within thrre days is not greater than fifteen, the sample passes the test. If the number is greater than fifteen the sample fails to pass the test.

APPENDIX XII

SIEVES

Number of Sieve.	Nominal Size of Aperture.		Nominal Diameter of Wire.		Standard wire gauge.	Approximate Screening area.	Tolerance in Average Aperture.
	Inch.	Millimetre.	Inch.	Millimetre.		Per Cent.	Per Cent.
100	0·0060	0·152	0·0040	0·102	42	36	6·2
200	0·0030	0·076	0·002	0·051	47	36	8·0

APPENDIX XIII

ALTERNATIVE PREPARATIONS SANCTIONED FOR USE IN INDIA

Unguentum Acidi Borici. A mixture of 73 grammes of Yellow Soft Paraffin and 27 grammes of Hard Paraffin may be used as a base in preparing this ointment.

Unguentum Hydrargyri. A mixture of 455 grammes of Yellow Soft paraffin and 230 grammes of Hard Paraffin may be used as a base in preparing this ointment.

Unguentum Hydrargyri Ammoniati. A mixture of 6·5 grammes of Yellow Soft Paraffin and 3 grammes of Hard Paraffin may be used as a base in preparing this ointment.

Unguentum Sulphuris. A mixture of 90 grammes of Yellow Soft Paraffin and 45 grammes of Hard Paraffin may be used as a base in preparing this ointment.

Unguentum Zinci Oxidi. A mixture of 70 grammes of Yellow Soft Paraffin and 32 grammes of Hard Paraffin may be used as a base in preparing this ointment.

APPENDIX XIV

A. *METHOD OF THIOCHROME ASSAY FOR ANEURINE HYDROCHLORIDE (VITAMIN B_1)*

REAGENTS

1. Enzyme Solution.

Prepare freshly a 10 per cent. solution in *water* of an enzyme preparation potent in diastatic and phosphorolytic activity.

2. Base Exchange Silicate.

Place 100 to 500 grammes of the base exchange silicate (50 to 80 mesh size) in a suitable beaker, add sufficient hot 3 per cent. *acetic acid* to cover the material, and boil for 10 to 15 minutes, stirring frequently. Allow to settle and decant the

supernatant liquid. Repeat this washing three times. Then wash in similar manner three times with a hot 25 per cent. aqueous solution of *potassium chloride* and finally wash with boiling *water* until free from chloride. Dry the material at about 100° and store in a well-closed container.

3. Base Exchange Tube.

This tube has an over-all length of 200 millimetres. A reservoir at the upper end is 50 millimetres in length and 25 millimetres in diameter. This converges into the adsorption tube which is 5 to 6 millimetres in internal diameter and approximately 140 millimetres long. At the lower end the tube is drawn into a capillary approximately 10 millimetres long and of such diameter that when the tube is charged the rate of flow will be not more than 1 millilitre per minute.

Prepare the tube for use by placing over the end of the capillary, with the aid of a glass rod, a pledget of fine glass wool. Add a *water* suspension of 1·0 to 2·0 grammes of the purified base exchange silicate to the adsorption tube, taking care to wash down all the silicate from the walls of the reservoir. To keep air out of the adsorption tube, a layer of liquid must be kept over the surface of the silicate throughout the adsorption process and the tube may be prevented from draining by placing a rubber cap (filled with water to avoid inclusion of air) over the lower end of the capillary.

4. Sodium Acetate 2N.

Dissolve 275 grammes of pure *sodium acetate* in sufficient *water* to make 1 litre.

5. Acid Potassium Chloride Solution.

Add 8·5 millilitres of *hydrochloric acid* to the 25 per cent. w/v solution of *potassium chloride* to make 1 litre.

6. Oxidizing Reagent.

Mix 4·0 millilitres of 1 per cent. w/v solution of *potassium ferricyanide* with sufficient quantity of the 15 per cent. w/v solution of *sodium hydroxide* to make 100 millilitres. This solution should be used within 4 hours.

7. Aneurine Hydrochloride Stock Solution.

Dissolve accurately weighed 60 to 75 milligrammes of absolutely dry powder in 20 per cent. alcohol adjusted to a pH of 3·5 to 4·3 with *hydrochloric acid* and make up to a volume of 1 litre. Store in a cool and dark place in a well-closed container.

8. Aneurine Hydrochloride Standard Solution.

From a portion of the stock solution, prepare the dilute solution adjusting the pH 3·5 to 4·3 with *hydrochloric acid* so that each millilitre contains 1 microgramme of aneurine hydrochloride.

Dilutions of this solution are treated in the same manner as that used in the *Preparation of Assay Solution* with respect to acid digestion, enzyme treatment, adsorption, and elution from the base exchange silicate.

Preparation of Assay Solution.

Digest the accurately weighed quantity (containing 30 to 100 microgrammes aneurine hydrochloride) with 65 millilitres of *N/10 sulphuric acid* (proportion of the sample to acid should be 1 to 15) on a steam bath with frequent mixing for 30 minutes. The liquid must remain acid during the digestion. Cool and adjust the pH to between 4 and 5 by the addition of 2N *sodium acetate* using bromocresol green as an external indicator. Add 5 millilitres of the enzyme solution, mix and incubate at 45° to 50° for 3 hours. Cool, centrifuge the mixture until the supernatant liquid is practically clear, and quantitatively transfer the supernatant liquid

to a 100 millilitre flask. Wash the residue by centrifuging with 10 millilitres, then with 5 millilitres of *N/10 sulphuric acid*. Add the washing to the original solution and dilute to 100 millilitres with *water*.

Pass through the prepared base exchange tube an aliquot of the solution (containing 5 to 10 microgrammes), and wash the tube thrice with 5 millilitres of boiling *water*.

Elute the vitamin by passing successively through the tube small portions of the hot *acid potassium chloride solution*. Collect the first 15 millilitres of the *eluate* in a 25 millilitre flask for the assay, cool and dilute to a volume of 25 millilitres with the *acid potassium chloride solution*.

Oxidation to Thiochrome and Measurement of Fluorescence.

Determine the aneurine content of the oxidised assay solution by comparing the intensity of fluorescence of an extract of this solution exposed to ultraviolet rays between 350 mμ. to 400 mμ. with that from the oxidised Aneurine Hydrochloride Standard Solution. The intensity of the fluorescence may also be measured with the aid of various instruments.

Add sufficient *acid potassium chloride solution* to the testing solution and to the similarly treated Aneurine Hydrochloride Standard Solution (containing 0·10 to 2 microgrammes) to produce a volume of 5 millilitres, followed by 3 millilitres of oxidising solution. Add 13 millilitres of *isobutyl alcohol* quickly and shake well for 2 minutes. Centrifuge slowly until a clear supernatant solution is obtained. Measure the fluorescence of the isobutyl alcohol solution directly if clear, or if cloudy, after shaking with 2 grammes of *anhydrous sodium sulphate*. Compare with this the intensity of fluorescence produced after oxidation of the properly prepared Aneurine Hydrochloride Standard Solution. Correction must be made for fluorescence produced by substances other than aneurine by determining the intensity of fluorescence of Aneurine Hydrochloride Standard Solution, and assay solution treated as described above, but with a 15 per cent. w/v solution of *sodium hydroxide* replacing the oxiding reagent.

NOTE. *Quinine Sulphate Solution (0·01 milligramme in 39 millilitres of N/10 Sulphuric acid) may be used to govern the reproductibility of the instrument. This solution is equivalent to 1 microgramme of aneurine hydrochloride. When a discrepancy occurs between the results of the Chemical Assay and the Biological Assay, the value obtained from the Biological Assay should be preferred.*

B. *MICROBIOLOGICAL ASSAY FOR RIBOFLAVIN*

MATERIALS AND SOLUTIONS

Test Solution of the Material to be Assayed.

Conduct the following operations, at all stages of the process so that the solutions are protected, as far as possible from light which destroys riboflavin.

Place an accurately weighed quantity of the material to be assayed, sufficient to represent approximately 0·2 milligramme of riboflavin, in a 1,000 millilitre flask, add 300 millilitres of *N/10 hydrochloric acid*, and mix thoroughly. Heat the mixture in an autoclave at 15 pounds pressure (121·5°) for 30 minutes, cool, add sufficient *N/10 sodium hydroxide* to produce a pH of 4·5, add sufficient *water* to make 1,000 millilitres, and filter through quantitative filter paper which is known not to adsorb riboflavin. To a 100 millilitre aliquot of the clear filtrate add *sodium hydroxide* to produce a pH of 6·8, add sufficient *water* to make 200 millilitres, and filter, if necessary, to obtain a clear solution.

Standard Riboflavin Solution.

Dissolve 50 milligrammes *riboflavin* accurately weighed, in sufficient dilute acetic acid (10 millilitres of diluted *acetic acid* to 500 millilitres

with *water*) to make 500 millilitres. Preserve this solution protected from light and under toluene, in a refrigerator. Prepare the Standard Solution by diluting 1 millilitre of the stock solution with sufficient *water* to make 1,000 millilitres, representing 0·1 microgramme of riboflavin in each millilitre. This solution must be freshly prepared.

Basal Medium Stock Solution.

Photolysed Peptone Solution	50 millilitres.
Cystine Solution	50 millilitres.
Yeast Supplement Solution	5 millilitres.
Dextrose Anhydrous	15 grammes.
Salt Solution A	2·5 millilitres.
Salt Solution B	2·5 millilitres.

Dissolve the anhydrous dextrose in the solutions previously mixed and, if necessary, adjust to a pH of 6·8 using *N/10 sodium hydroxide*. Finally add sufficient *water* to make 250 millilitres of solution.

Photolysed Peptone Solution.

Dissolve 40 grammes of peptone in 250 millilitres of *water*, and 20 grammes of *sodium hydroxide* in 250 millilitres of *water*, mix the solutions in a crystallising dish having a diameter of about 25 centimetres. At a distance of about 1 foot from the dish place a 100-watt bulb fitted with a reflector, and expose the solution to light from the bulb for 6 to 10 hours, then allow the mixture to stand for the remainder of a 24-hour period. Maintain the solution during this treatment at a temperature not exceeding 25°. Neutralise the *sodium hydroxide* with *glacial acetic* acid, and add 7 grammes of anhydrous *sodium acetate* and sufficient *water* to make the solution measure 800 millilitres. Preserve the solution under toluene in a refrigerator.

Cystine Solution.

Dissolve 1 gramme of *l*-cystine in 20 millilitres of 10 per cent. w/v aqueous solution of *hydrochloric acid* and add sufficient *water* to make the solution measure 1,000 millilitres. Store the solution under toluene in a refrigerator not below 10°.

Yeast Extract Solution.

Heat a mixture of 500 grammes of fresh baker's yeast (starch-free) and 5 litres of *water* in flowing steam for 2 hours, then autoclave it at 15 pounds pressure (121·5°) for 40 minutes. Allow the mixture to settle, filter, and evaporate the filtrate to a volume of 125 millilitres, under reduced pressure, at a temperature not exceeding 50°.

Yeast Supplement Solution. Add 125 millilitres of an aqueous solution containing 38 grammes of *lead subacetate* to 125 millilitres of the yeast extract solution. Filter, and add *dilute solution of ammonia* to the filtrate to produce a pH of 10. Filter, and add *glacial acetic acid* to the filtrate to produce a pH of 6·5. Precipitate the excess lead with hydrogen sulphide, filter, and add sufficient *water* to the filtrate to make 250 millilitres. Preserve the solution under toluene in a refrigerator. Prepare a fresh solution at not more than 30 day intervals.

Salt Solution A.

Dissolve 25 grammes of *monobasic potassium phosphate* and 25 grammes of *dibasic potassium phosphate* in sufficient *water* to make 250 millilitres of solution.

Salt Solution B.

Dissolve 10 grammes of *magnesium sulphate*, 0·5 gramme of *sodium chloride*, 0·5 gramme of *ferrous sulphate*, and 0·5 gramme of *manganese sulphate* in *water* to make 250 millilitres.

Stock Culture of Lactobacillus Casei.

To 10 millilitres of Yeast extract solution in 90 millilitres of *water*, add 1 gramme of *anhydrous dextrose* and 1·5 grammes of *agar*, and heat the mixture on a steam bath until the agar has dissolved. Add approximately 10 millilitre portions of the hot solution to test tubes, plug the tubes with non-absorbent cotton, sterilise in an autoclave at 15 pounds pressure (121·5°) for 20 minutes, and allow to cool in an upright position. Prepare stab cultures in 3 or more of the tubes, using a pure culture of *Lactobacillus casei*, incubate for 16 to 24 hours at any selected temperature between 30° to 37°, but held constant to within ±0·5°, and finally store in a refrigerator. Prepare a fresh stab of the stock culture every week, and do not use for inoculum if the culture is more than 2 weeks old.

Culture Medium.

To each of a series of tubes containing 5 millilitres of the basal medium stock solution, add 5 millilitres of *water* containing 1 microgramme of riboflavin. Sterilise in an autoclave at 15 pounds pressure (121·5°) for 20 minutes.

Inoculum.

Make a transfer of cells from the stock culture of *Lactobacillus casei* to a sterile tube containing 10 millilitres of culture medium. Incubate this culture for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0·5°. Make a transfer of 1 drop from this tube to another sterile tube of culture medium, and incubate for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0·5°. Under aseptic conditions centrifuge the culture and decant the supernatant liquid. The inoculum is prepared by suspending the cells from the culture in 10 millilitres of sterile *isotonic solution of sodium chloride*. If assays are to be made on each of several successive days, the inoculum may be prepared by successive daily transfers to the culture medium for a period not exceeding 1 week.

METHOD

Prepare standard riboflavin tubes as follows. To duplicate tubes 16 × 150 millilitres in size, add 0·0 millilitre, 0·5 millilitre, 1·0 millilitre, 1·5 millilitres, 2·0 millilitres, 2·5 millilitres, 3·0 millilitres, and 5·0 millilitres, respectively of the standard riboflavin solution. To each of these add 5 millilitres of basal medium stock solution and sufficient *water* to bring the volume in each tube to 10 millilitres.

Prepare tubes containing the material to be assayed as follows :—To duplicate tubes add, respectively, 0·5 millilitre, 1·0 millilitre, 1·5 millilitres, and 2·0 millilitres of the Test Solution to be assayed. To each of these tubes add 5 millilitres of basal medium stock solution and sufficient *water* to bring the volume in each tube to 10 millilitres.

After mixing thoroughly, plug the tubes of the two series mentioned above with non-absorbent cotton and autoclave at 15 pounds pressure (121·5°) for 20 minutes. Cool, aseptically inoculate each tube with 1 drop of inoculum and incubate for 72 hours at any selected temperature between 30° and 37°, but held constant to within ±0·5°. Contamination of the assay tubes with any organism other than *Lactobacillus casei* invalidates the assay. Keep all of the tubes in darkness or semi-darkness during their preparation and incubation. Transfer the contents of each tube to a suitable container using approximately the same quantity of *water* in each instance for rinsing. Titrate the contents of each flask with *N/10 sodium hydroxide*, using bromothymol blue as the indicator, or to a pH of 6·8 measured electrometrically.

Calculation.

Prepare a standard curve of the riboflavin standard titrations by plotting the average of the titration values expressed in millilitres of *N/10 sodium hydroxide* for each level of the riboflavin standard solution used, against microgrammes of

riboflavin contained in the respective tubes. From this standard curve determine by interpolation the riboflavin contents of the test solution in each duplicate set of tubes. Discard any values which show more than 0·25 or less than 0·05 microgramme of riboflavin in each tube. Calculate the riboflavin content in each millilitre of test solution for each of the duplicate set of tubes. The riboflavin content of the test material is calculated from the average of the values obtained from not less than three sets of these tubes which do not vary by more than ± 10 per cent. from the average. If the titration values of two or more of the duplicate sets of tubes containing the test solution fall below the titration values of the riboflavin standard tubes containing 0·05 to 0·25 microgramme of riboflavin, the riboflavin content of the test solution is too low to permit calculation of riboflavin content of the test material. Titration values exceeding 2 millilitres for the tubes of the standard riboflavin solution series containing 0·0 millilitre of the solution indicate the presence of an excessive amount of riboflavin in the basal medium stock solution and invalidate the assay.

C. *CHEMICAL METHOD OF ESTIMATION OF NICOTINIC ACID OR NICOTINAMIDE.*

1. Reagents

(1) Standard Nicotinic Acid Stock Solution. 1 millilitre is equivalent to 1 milligramme of nicotinic acid dissolved in *N/100 hydrochloric acid*, and kept in a refrigerator.

(2) Standard Nicotinic Acid Solution. 1 millilitre is equivalent to 10 microgrammes of nicotinic acid, prepared fresh as required by diluting 0·5 millilitre of the Standard Nicotinic Acid Stock Solution to 50 millilitres after neutralising with 0·5 millilitre of *N/10 sodium hydroxide.*

(3) Aqueous Cyanogen Bromide. This is prepared fresh by decolourising in the cold a saturated aqueous solution of bromine by gradual addition of 10 per cent. pure sodium cyanide solution.

(4) Aqueous Aniline Solution. This is prepared fresh by dissolving 2 millilitres of *aniline* in 80 millilitres of *water* and diluting to 100 millilitres.

(5) Phosphate buffer, pH 7.

2. Hydrolysis

Treat a weighed amount of the material (containing 50 to 400 microgrammes of nicotinic acid) with 80 millilitres *water*. Heat the mixture at about 80° for 10 minutes with constant stirring. Add 20 millilitres of 36 per cent. *hydrochloric acid* and continue the heating for another 10 minutes. Cool the mixture and centrifuge. Heat an aliquot part (50 millilitres) of the clear extract at 90 to 100° for 40 minutes for complete hydrolysis.

3. Removal of protein derivatives and colouring matter

Cool the extract and neutralise to about pH 5 by the addition of 20 per cent. w/v *sodium hydroxide solution*. Add 5 millilitres of *N/1 barium acetate* and remove the precipitate. Add 1 millilitre of 20 per cent. w/v *zinc sulphate* solution to the clear centrifugate. Zinc hydroxide is precipitated by *N/1 sodium hydroxide* at pH 9·5 using *phenolphthalein* as internal indicator. Excess of sodium hydroxide should be avoided. Remove the precipitate by centrifuging. Precipitate again the excess of barium by 1 millilitre of 5 N *sulphuric acid* and remove the precipitate on the centrifuge. Filter the clear extract after adjusting it at pH 7·0 by 5 N *sodium hydroxide*. About 13 millilitres of the final clear solution (representing 10 millilitres of the original extract and one-tenth of the weight of the material taken for assay) are used for the colorimetric estimation. If the solutions are slightly coloured, the results are corrected by 'blank' estimations.

4. Colorimetric estimation

Take aliquot (13 millilitres) of the extracts in a series of 25 millilitre measuring flasks. Take 20 microgrammes of nicotinic acid present in 2 millilitres of Standard

Nicotinic Acid Solution in another flask and dilute to 13 millilitres by *water*. Add 0·5 millilitres of 50 per cent. w/v *sodium acetate solution* (adjusted to pH 7·0) to each flask and then add 1 millilitre of 2 per cent. saturated aqueous solution of *aniline* to all flasks, followed by 6 millilitres of freshly prepared cyanogen bromide solution. Shake the contents of the flasks and make up to 25 millilitres by aqueous solution of *aniline*. Compare the colours within 2 to 6 minutes. A 'blank' estimation, if necessary, is carried out in the same way with the exception that *water* is used instead of cyanogen bromide, and the values, so obtained for the 'blank', are subtracted in the usual manner for the 'test' values to obtain the true values.

D. *THE TINTOMETRIC METHOD FOR ESTIMATION OF VITAMIN A*

Preparation of the Solution of the Unsaponifiable Matter.

Boil 1 gramme of the oil with 10 millilitres of freshly prepared N/2 *alcoholic solution of potassium hydroxide* for five minutes, or until the solution is clear. Add 20 millilitres of *water*, transfer to a small separator, and extract with two successive quantities of 25 millilitres of *anæsthetic ether*. Wash the mixed ethereal solutions by gentle rotation, without violent shaking successively with 10 to 20 millilitres of *water*, with 10 to 20 millilitres of N/2 *potassium hydroxide*, and with *water*. Again wash the ethereal solution by shaking thoroughly with two successive quantities of 10 millilitres of *water*, filter into a flask, remove the ether, and dissolve the residue in a sufficient quantity of chloroform to produce a solution of the concentration required for the instrument to be used. A preliminary test on the untreated oil will indicate the quantities of oil and of solvent, which will be necessary.

Description of Test.

Take 0·2 millilitre of this solution, measured at 20° by a 1 millilitre pipette, the graduated portion of which is at least 15 centimetre long. Put it in a colourless rectangular glass cell of 10 millimetres internal measurement in the direction of observation. Place the glass cell in a colorimeter, designed for matching the colour of the solution against colour glasses. Add rapidly 2 millilitres of *antimony trichloride reagent*, in such a way that the solutions mix. Simultaneously observe the development of a blue colour, which rapidly reaches a maximum and then fades. By means of combinations of graded colour glasses, match the colour at the point of maximum intensity.

It may be necessary to employ yellow and red, as well as blue glasses.

In order to obtain an accurate match, it may be necessary to diminish the transparency on the side of the cell; this must be done by adding on that side neutral tinted glasses, the value of which should be disregarded.

The dilution of the chloroform solution should be so adjusted that the reading lies between 4 to 6.

Several preliminary observations must be made, in order to enable subsequent readings to be taken without undue delay in arranging the glasses, and to determine how long after mixing the point of maximum intensity of colour is attained. The maximum intensity may develop within ten seconds, but the time varies with different oils. It is essential to make the final match at the point of maximum intensity of the blue colour.

Neither the solution to be tested, nor the *antimony trichloride* reagent, must come into contact with rubber.

In the case of Shark Liver Oil, one unit of Blue Value (Carr-Price value) corresponds approximately to 50 International Units of Vitamin A.

Antimony Trichloride Reagent.

A solution of antimony trichloride in pure dry chloroform, saturated at 20°, is prepared in the following way:—Wash *chloroform* two or three times with its own volume of *water*, and dry it over *anhydrous potassium carbonate*; pour off and distil,

rejecting the first 10 per cent. of the distillate. During the distillation protect the chloroform from light. Wash *antimony trichloride* with the pure dry chloroform until the washings are clear. Prepare a solution, saturated at 20°, of the washed antimony trichloride in the pure dry chloroform. The solution contains not less than 21 per cent. w/v and not more than 23 per cent. w/v of antimony trichloride and should be kept in a well-stoppered colourless glass bottle of good quality and painted on the outside to exclude light.

Assay. Mix 1 millilitre with a solution of 2 grammes of *sodium potassium tartrate* in 20 millilitres of *water*, rotate the mixture, add 2 grammes of *sodium bicarbonate*, and titrate with *N/10 iodine*. Each millilitre of *N/10 iodine* is equivalent to 0·01141 grammes of antimony trichloride.

E. *SPECTROPHOTOMETRIC METHOD OF ESTIMATION OF VITAMIN A*

Carry out the *Spectrophotometric method of assay of vitamin A*. B.P. 1932, First Addendum 1936, p. 89.

F. *MICROBIOLOGICAL ASSAY FOR NICOTINIC ACID OR NICOTINAMIDE*

Test Solution of the Material to be Assayed.

Place an accurately weighed quantity of the material to be assayed, sufficient to represent approximately 0·1 milligramme of nicotinic acid, in a 300 millilitre flask, add 100 millilitres of normal *sulphuric acid*, and mix thoroughly. Heat the mixture in an autoclave at 15 pounds pressure (121·5°) for 30 minutes, cool, add solution of sodium hydroxide to produce a pH of 6·8, and add sufficient *water* to make 1,000 millilitres.

Standard Nicotinic Acid Solution.

Accurately weigh 50 milligrammes of pure Nicotinic Acid and add sufficient alcohol to make 500 millilitres. Store this stock solution in refrigerator. Prepare the Standard Solution by diluting 1 millilitre of the stock solution which has been warmed to room temperature, with sufficient *water* to make 1,000 millilitres, representing 0·1 microgramme of the Standard in each millilitre of solution. Prepare fresh Standard Solution for each assay.

Basal Medium Stock Solution.

Acid-hydrolysed Casein Solution	25 millilitres.
Cystine Solution	100 millilitres.
Tryptophane Solution	50 millilitres.
Anhydrous Dextrose	5 grammes.
Sodium Acetate	3 grammes.
Adenine-Guanine-Uracil Solution	5 millilitres.
Aneurine Hydrochloride Solution	0·5 millilitre.
Calcium Pantothenate Solution	0·5 millilitre.
Pyridoxine Hydrochloride Solution	1 millilitre.
Riboflavin Solution	1 millilitre.
p-Aminobenzoic Acid Solution	0·5 millilitre.
Biotin Solution	2 millilitres.
Salt Solution A	2·5 millilitres.
Salt Solution B	2·5 millilitres.

Mix the ingredients, adjust the solution to a pH of 6·8, and add sufficient *water* to make 250 millilitres.

Acid-hydrolyzed Casein Solution.

Mix 100 grammes of vitamin-free casein with 500 millilitres of constant-boiling hydrochloric acid (approximately 20 per cent.) and reflux the mixture for 8 hours. Remove the hydrochloric acid from the mixture by distillation under reduced pressure until a thick syrup remains. Dissolve the syrup in *water* and concentrate the mixture again in the same manner. Redissolve the resulting syrup in *water*, adjust the solution to a pH of 3·0 with *solution of sodium hydroxide*, and add sufficient *water* to make 950 millilitres. Add to the solution 20 grammes of activated charcoal, and stir for an hour, then filter. Repeat the treatment with activated charcoal if the filtrate does not appear straw coloured to colourless. Adjust the pH of the filtrate to 6·8 and add sufficient *water* to bring the volume to 1,000 millilitres. Store this solution under toluene in a refrigerator.

Cystine Solution.

Dissolve 1 gramme of *l*-cystine in 20 millilitres of 10 per cent. *hydrochloric acid* and add sufficient *water* to make the solution measure 1,000 millilitres. Store the solution under toluene in a refrigerator not below 10°.

Tryptophane Solution.

Dissolve 1 gramme of *l*-tryptophane in 5 to 6 millilitres of 20 per cent. *hydrochloric acid* and add sufficient *water* to make 1,000 millilitres. Store the solution under toluene in a refrigerator.

Adenine-Guanine-Uracil Solution.

Dissolve 0·1 gramme each of adenine sulphate, guanine hydrochloride, and uracil with the aid of heat in 5 millilitre of 20 per cent. *hydrochloric acid*, and sufficient *water* to make 100 millilitres. Store the solution in a refrigerator.

Aneurine Hydrochloride Solution.

Prepare a solution containing 0·1 milligramme per millilitre by dissolving crystalline aneurine hydrochloride in 25 per cent. alcohol adjusted to a pH of 3 with *hydrochloric acid*. Store the solution in a refrigerator.

Calcium Pantothenate Solution.

Prepare a solution containing 0·1 milligramme per millilitre by dissolving crystalline calcium pantothenate in neutral 25 per cent. alcohol. Store the solution in a refrigerator.

Pyridoxine Hydrochloride Solution.

Prepare a solution containing 0·1 milligramme per millilitre by dissolving crystalline pyridoxine hydrochloride in 25 per cent. alcohol. Store the solution in a refrigerator.

Riboflavin Solution.

Prepare a solution containing 0·1 milligramme per millilitre by dissolving crystalline riboflavin in fiftieth-normal *acetic acid*. Store the solution, protected from light, in a refrigerator.

p-Aminobenzoic Acid Solution.

Prepare a solution containing 0·1 milligramme per millilitre by dissolving crystalline p-aminobenzoic acid in 25 per cent. alcohol. Store the solution in a refrigerator.

Biotin Solution.

Prepare a solution containing 0·1 microgramme per millilitre by dissolving crystalline biotin (free acid) in 50 per cent. alcohol. Store the solution in a refrigerator.

Salt Solution A.

Dissolve 25 grammes of *monobasic potassium phosphate* and 25 grammes of *dibasic potassium phosphate* in sufficient *water* to make 250 millilitres of solution.

Salt Solution B.

Dissolve 10 grammes of *magnesium sulphate*, 0·5 gramme of *sodium chloride*, 0·5 gramme of *ferrous sulphate* and 0·5 gramme of *manganese sulphate* in sufficient *water* to make 250 millilitres.

Vitamin-free Casein.

Casein which has been extracted by one of the procedures commonly used for the removal of water-soluble vitamins.

Stock Culture of Lactobacillus Arabinosus

To 5 millilitre of yeast extract solution in 95 millilitres of *water*, add 1 gramme of anhydrous *dextrose* and 1·5 grammes of *agar*, and heat the mixture on a steam bath until the agar has dissolved. Add approximately 10 millilitre portions of the hot solution to test tubes, plug the tubes with non-absorbent cotton, sterilise in an autoclave at 15 pounds pressure (121·5°) for 20 minutes, and allow to cool in an upright position. Prepare stab cultures in 3 or more of the tubes, using a pure culture of *Lactobacillus arabinosus**, incubate for 16 to 24 hours at any selected temperature between 30° to 37°, but held constant to within 0·5°, and finally store in a refrigerator. Prepare a fresh stab of the stock culture every week and do not use for inoculum if the culture is more than 2 weeks old.

Culture Medium.

To each of a series of tubes containing 5 millilitres of the basal medium stock solution add 5 millilitres *water* containing 2 microgrammes of nicotinic acid. Sterilize in an autoclave at 15 pounds pressure (121·5°) for 20 minutes.

Inoculum.

Make a transfer of cells from the stock culture of *Lactobacillus arabinosus* to a sterile tube containing 10 millilitres of culture medium. Incubate this culture for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ± 0·5°. Make a transfer of one drop from this tube to another sterile tube of culture medium and incubate for 16 to 24 hours at any selected temperature between 30° and 37°, but held constant to within ±0·5°. Under aseptic conditions centrifuge the culture and decant the supernatant liquid. The inoculum is prepared by suspending the cells from the culture in 10 millilitres of sterile isotonic solution of sodium chloride. If assays are to be made on each of several successive days, the inoculum may be prepared by successive daily transfers in the culture medium for a period not exceeding 1 week.

Assay Procedure. Prepare standard nicotinic acid tubes as follows :—To duplicate tubes, 16 × 150 millimetres in size, add 0·0 millilitre, 0·5 millilitre, 1·0 millilitre, 1·5 millilitres, 2·0 millilitres, 2·5 millilitres, 3·0 millilitres, 3·5 millilitres, 4·0 millilitres, 4·5 millilitres, and 5·0 millilitres, respectively, of the standard nicotinic acid solution. To each of these tubes add 5 millilitres of basal medium stock solution and sufficient *water* to bring the volume in each tube to 10 millilitres.

Prepare tubes containing the material to be assayed as follows. To duplicate tubes add, respectively, 1·0 millilitre, 2·0 millilitres, 3·0 millilitres, and 4·0 millilitres of the test solution of the material to be assayed. To each of these tubes add 5 millilitres of basal medium stock solution and sufficient *water* to bring the volume in each tube to 10 millilitres.

After thorough mixing plug the tubes of the two series mentioned above with non-absorbent cotton, and autoclave at 15 pounds pressure (121·5°) for 20 minutes.

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*May be obtained from the National Type Culture Collection, kept at the Indian Institute of Science, Bangalore.

Cool, aseptically inoculate each tube with 1 drop of inoculum and incubate for 72 hours at any selected temperature between 30° and 37°, but held constant to within ±0·5°. Contamination of the assay tubes with any organisms other than *Lactobacillus arabinosus* invalidates the assay.

Transfer the contents of each tube to a suitable container, using approximately the same quantity of *water* in each instance for rinsing. Titrate the contents of each flask with *N/10 sodium hydroxide* using *bromothymol blue* as the indicator, or to a pH of 6·8 measured electrometrically.

Calculation.

Prepare a standard curve of the nicotinic acid standard titrations by plotting the average of the titration values expressed in millilitre of tenth-normal sodium hydroxide for each level of nicotinic acid standard solution used, against microgrammes of nicotinic acid contained in the respective tubes. From this standard curve determine by interpolation the nicotinic acid content of the test solution in each duplicate set of tubes. Discard any values which show more than 0·4 or less than 0·05 microgramme of nicotinic acid in each tube. Calculate the nicotinic acid content in each millilitre of test solution for each of the duplicate sets of tubes. The nicotinic acid content of the test material is calculated from the average of the values obtained from not less than 3 sets of these tubes which do not vary by more than ±10 per cent. from the average. If the titration values of two or more of the duplicate sets of tubes containing the test solution fall below the titration values of the Nicotinic Acid Standard tubes containing 0·05 to 0·4 microgramme of nicotinic acid, the nicotinic acid content of the test solution is too low to permit calculation of nicotinic acid content of the test material. Titration values exceeding 2 millilitres for the tubes of the standard nicotinic acid solution series containing 0·0 millilitre of the solution indicate the presence of an excessive amount of nicotinic acid in the basal medium stock solution and invalidate the assay.

INTRODUCTION BY THE INDIAN PHARMACOPŒIAL LIST COMMITTEE.

In the preparation of the Indian Pharmacopœial List, the Indian Pharmacopœial List Committee limited its efforts to the following terms of reference :—

1. To prepare a list of drugs in use in India, which although not included in the British Pharmacopœia, are of sufficient medicinal value to justify their inclusion in the official Pharmacopœia ;
2. to recommend standards of identity and tests for purity and assay of these drugs with a view to securing uniformity in prescription and,
3. to follow the general practice of the British Pharmacopœia in the compilation of the List.

The first term of reference was naturally the central problem of enquiry before the Committee and the second was subsidiary, though of more importance from the point of view of a 'book of standards'. To define "drugs of sufficient medicinal value" is a task beset with unusual difficulty in a country where 2,000 odd indigenous drugs of vegetable, mineral and animal origin are still being used and for which varying degrees of therapeutic claims are advanced in one or other of the treatises on indigenous materia medica. The scantiness of reliable and accurate chemical, pharmacological and 'controlled' clinical data on the majority of these indigenous remedies made it all the more difficult for the Committee to arrive at an agreed and satisfactory solution as to what drugs should be recognised for inclusion in the Indian Pharmacopœial List. The Committee, however, endeavoured, as far as was possible within its competency and the time allotted to its work, to sift all the evidence available on each item before coming to a decision with regard to their final adoption. The Committee has been guided primarily by a desire to select only those substances, which possess definite medicinal value and the utility of which is most fully established and best understood at the present moment. The mere fact that a drug is frequently prescribed and is popular with the profession has not been considered a sufficient justification for its inclusion, unless authoritative scientific data were available with regard to its chemical composition, pharmacological action and therapeutic uses. This guiding principle in selection has been responsible for the deletion of a number of items which might appear to many readers as worthy of inclusion in the List. The Committee, however, are unanimous in their opinion that unless a drug satisfies all the modern requirements with regard to standards of identity, purity, and assay and unless a drug is considered to be of sufficient merit to deserve

continuance of its use by prescribers in India, it should not be given recognition in the first Indian Pharmacopœial List, which is intended to serve as a Supplement to the British Pharmacopœia. Further researches and studies in this field would naturally bring out new data and in pursuance of the practice followed in other countries, such as the U. K. and the U. S. A., the Indian Pharmacopœial List should be revised at regular intervals, when attempts should be made to incorporate any further therapeutic agents satisfying the above conditions which would be forthcoming at that stage.

The Committee's first efforts were to consider for inclusion 'substitutes' of some of the B.P. drugs. It has long been felt that adequate recognition should be given to some of the substitutes occurring in India, which though differing in certain pharmacognostic characteristics and chemical standards, nevertheless possess medicinal properties comparable to their counterparts in the 'official' Pharmacopœia. The recognition of certain Indian species as substitutes has already been accorded by the B. P. in permitting the inclusion of such preparations as Indian Podophyllum, Indian Valerian, Indian Belladonna, Indian Squill, Indian Ginger, etc. In the Committee's views the same principle could be easily extended to a large number of other substances of Indian origin, *e.g.*, Indian Acacia, Indian Aconite, Indian Aloes, Indian Asafœtida, Indian Senega, Indian Colchicum, Indian Hyoscyamus, Indian Lobelia, etc.

A number of essential and fixed oils available in India are not of the same standards as prescribed in the B.P., *e.g.*, Eucalyptus oil of the Nilgiris never gives a cineole content higher than 55 per cent. against the B.P. minimum demand of 70 per cent. There is hardly any evidence pointing to the fact that a little lower cineole content would be detrimental to therapeutic utility. The Committee therefore thought it desirable to include such items in order that the Indian products could be given pharmacopœial status and used in pharmaceutical practice in India. Similarly, such raw materials as Beeswax, Honey, Chalk, Lead Acetate, Purified Talc, etc., of Indian origin can be very easily used in place of the 'official' substances, though, in most cases, their physical characters and other standards of identity and purity might vary from the B.P. specifications.

Ergot is now cultivated in India and according to the findings of most Indian observers, Indian Ergot gives, on an average, a lower alkaloidal content than the figure of 0·2 per cent. recommended in the sixth Addendum to the B.P. The Committee has, therefore, considered it desirable to include Indian Ergot with a lower alkaloidal content. The galenical preparation, however, has been kept of the same strength as that in the B.P. to avoid confusion of dosage levels in prescriptions.

The iodine content of thyroid glands in Indian cattle is definitely higher than that recorded elsewhere and it is necessary, therefore, to recognise this in the Indian Pharmacopœial List with a separate monograph. The need for the recognition of certain changes in 'standards of purity' and methods of storage and stabilisation under Indian conditions has necessitated the inclusion of monographs on Anæsthetic Ether, Injection and Solution of Adrenaline Hydrochloride, Hydrogen Peroxide Solution, etc.

The next important group of drugs with which the Committee had to deal were the indigenous drugs of plant origin. India, as is well-known, possesses a rich materia medica, which has been handed down to her from ages. While this materia medica contains drugs of definite therapeutic value which can be easily adopted in modern medicine, there cannot be any two opinions that along with these, many items of doubtful or of no therapeutic value have crept into it during the passage of time on meagre and non-scientific evidence. The problem of picking out the really useful remedies has not been an easy task. The work of the Indigenous Drugs Enquiry of the Indian Research Fund Association carried out under the direction of our Chairman, Col. Sir Ram Nath Chopra, has thrown considerable light on some of the useful drugs of the indigenous materia medica and the Committee has utilised this evidence. The difficulty however of providing standards of identity, purity and assay for many of these drugs has prevented the Committee from accepting them for inclusion in the present Indian Pharmacopœial List. The drugs which have ultimately been included are chiefly those whose standards have been either worked out under the supervision of the Sub-Committee of the Indian Pharmacopœial List Committee at the Bio-Chemical Standardisation Laboratory or have been otherwise made available from literature or from evidence collected through the work of other experts and members of the Sub-Committee.

Certain substances of animal origin such as Catgut, Shark-Liver Oil, etc., are now being produced in India and the Committee has taken special care in providing 'standards' for them, so that their production could be stimulated. Shark Liver Oil is available in fairly large quantities in India now and is a rich source of vitamin A, a good sample yielding weight for weight as much as three times the Vitamin A value of Cod Liver Oil. In line with the B.P. 1932, a minimum standard for Shark-Liver Oil, based upon the Lovivond Tintometric test and the Spectrophotometric test, has been included.

A few biological products of particular importance to India such as Cholera, Rabies and Plague Vaccines have been included because these items have been in use in India for a long time. Standards for these have not yet been provided for in the B.P. 1932. The Committee, however, felt that knowledge with regard to these has now come to such a

stage of clarity that their inclusion in the Indian Pharmacopœial List would be justified. Communication has since been received from the British Pharmacopœia Commission that these items are also being considered for inclusion in the next edition of the B.P. The Committee recommends the inclusion of these in the Indian Pharmacopœial List with the hope that these standards would be considered acceptable until such time as the next edition of the British Pharmacopœia is published, when these monographs could be reviewed and changed, if necessary.

In view of the popularity and frequent use of the snake venoms in medical practice in India, two monographs on cobra and viper venoms have been included. The standards and methods of assay recommended by the Committee for these items are still under critical examination and only a tentative method of assay is at present included.

The establishment of a 'Blood Bank' in Calcutta during the war has enabled the Committee to get the details of preparation of the Normal Human Serum and the Normal Human Plasma for treatment of shock and similar conditions. Experience at the Blood Bank indicated that the method and the standards procedures recommended in the U.S.P. and other publications need considerable revision in the light of Indian conditions. These items have, therefore, been included for the special guidance of Indian workers.

During the Bengal Famine of 1943, a protein breakdown product known as 'Proteinum Hydrolysatum' was employed to counteract protein deficiency in cases of starvation. Preliminary experience in the intravenous administration of this substance being encouraging, the preparation has since been elaborated and made suitable for intravenous administration in cases of hypoproteinæmia and similar conditions caused by starvation and wasting diseases. A monograph on 'Injectio Proteini Hydrolysati' has, therefore, been included.

Certain substances which are used mainly as colouring agents have been included, *e.g.*, Crocus, Caramel, etc., owing to their being used in India for colouring certain types of preparations. Besides, these have been found to be innocuous colouring agents. A synthetic colouring agent, Amaranth, has been introduced as this is largely used in the preparation of Compound Tincture of Cardamom in India and also to colour Arsenical Solution, so that the latter can be easily distinguished as a preparation containing a 'poisonous ingredient'.

Paris Green and Pyrethrum, which are used as insecticides and D.D.T., which is a de-lousing agent, have been included in the List. Though Paris Green is never used as a drug, it has important uses as a larvicide in India and it is essential that proper 'standards' should be laid down for the guidance of the manufacturers of this product.

In general, synthetic compounds and other substances, apart from those included in the B. P., have not been included in the Indian Pharmacopœial List. Moreover, a few substances which are widely used in India and which have not yet been given recognition in the B. P., are included, *e.g.*, Urea Stibamine, Tetrachloroæthylene, Trichloroæthylene, etc. These have particular bearing on medical treatment in India.

Only two drugs, *viz.*, Areca and Phenothiazin, which are finding increasing use in veterinary medicine have been included in the List. The first of these is plentifully available in India and if a standard is provided, there is a likelihood of its increasing use in veterinary practice.

The botanical nomenclature which has been adopted is in accordance with the International Rules of Botanical Nomenclature as revised at the last International Botanical Congress held at Cambridge in 1930. In describing the parts of plants, the macroscopic and the microscopic characters have been detailed; in some instances these characters are the only means of ascertaining their identity and degree of purity. Attempts, however, have been made, wherever possible, to introduce reliable chemical tests for identity and purity.

Several papers contributed by the Members of the Sub-Committee and the Bio-Chemical Standardisation Laboratory to scientific periodicals have been of great value in the work of compilation. Many of these papers have already been published and others are itended to be published in the near future.

In preparing the Indian Pharmacopœial List, the Committee has freely consulted the British Pharmacopœia, the British Pharmaceutical Codex, the United States Pharmacopœia, the National Formulary, the New and Non-official Remedies, the Canadian Supplement to the British Pharmacopœia, and the United States Dispensatory and also many authoritative books and references, too numerous to be mentioned here. Acknowledgments are made to all these sources, particularly to the B.P., the B.P.C., the U.S.P., and the U.S.D. for many details, which have been adopted from these sources. In many cases the standards laid down in such authoritative books were found to agree with the Indian standards and in all such cases, these standards have been adopted. Additional standards and tests, wherever possible, to exclude particular types of adulteration common in India have also been included. Without the help of these books, the Committee feels that it would not have been possible for them to publish such a text of 'drug standards' suitable for use in India in such a short time.

The Committee is fully aware of the incompleteness of the task that it has performed and is conscious of the many gaps in its knowledge, which it would have liked to fill, provided sufficient time was available. In full realisation of the fact, however, that a beginning should be made

at some point, the Committee is submitting its Report without asking for an extension of time. The Committee hopes that when the first Indian Pharmacopœial List is printed and made available to the members of the medical and pharmaceutical professions and the drug trade, constructive comments and criticisms would be received which will enable a Permanent Committee, which we are recommending for the purpose, to revise the Second Edition of the List in such a way as to bring it to a status on a par with similar books of standards published from other parts of the world. In the near future, pharmaceutical and pharmacological research are expected to progress to enable a better standard to be achieved in India.

The Committee desires to place its deep sense of appreciation of the help it received from the Sub-Committee in undertaking the strenuous task of analysing the replies to the Questionnaire, in drafting monographs, in consulting pertinent literature from various Libraries in Calcutta and also conducting under its supervision at the Bio-Chemical Standardisation Laboratory confirmatory trials on doubtful statements and analytical tests. But for this service, carried out at great sacrifice of time and energy of the busy members of the Sub-Committee, the Committee could not hope to achieve whatever little has been done towards the compilation of the first book of 'drug standards' in India.

The Committee wishes to place on record that the task of preparing the Indian Pharmacopœial List was conducted under great stress and pressure. The period of six months or so fixed by the Government of India for the submission of the List in its final form did not bear any proportion to the magnitude of the task or to the extent and the complexity of the problem which the Committee had to face. From the very beginning, the Committee had to race against time, particularly because most of its work had to be done by correspondence, which necessarily involved delay. The brunt of correspondence and the integration of all data and opinion received fell on Dr. B. Mukerji, the Convenor of the Sub-Committee at the Bio-Chemical Standardisation Laboratory, and the Committee are indebted to him for the ability, care and thoroughness with which he discharged his duties. Mr. S. N. Bal deserves our best thanks for his efforts in collecting from all over India authentic Indian names and specimens of crude drugs without which it would not have been possible for him either to identify the large number of crude drugs or to work out their pharmacognostic characters. The Committee proposes to preserve for future reference this valuable collection in the Office of the Director-General, Indian Medical Service, New Delhi. The thanks of the Committee are due to Messrs. A. F. MacCulloch and P. M. Nabar, the Secretaries, for their ready co-operation in all matters and for the efficient co-ordination of the office work between

Calcutta and Delhi. Mr S. C. Ganguly, M.Sc., Technical Assistant and Mr. Sankar Maitra, M.Sc., Botanical Assistant to the Sub-Committee at the Bio-Chemical Standardisation Laboratory and at the Industrial Section Laboratory of the Indian Museum and other members of the staff also deserve our thanks for services rendered under conditions of great strain during extra office hours on Sundays and holidays.

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INDEX OF COMMON INDIAN NAMES

Abbreviations used in this Index:

Assam	Assamese	Nep.	Nepalese
B.	Bengali	Or.	Oriya
Bel.	Beluchi	P.	Punjabi
Guj.	Gujerathi	Pus.	Pushtoo
H.	Hindi	S.	Sanskrit
Kan.	Kanarese	Sant.	Santali
Kash.	Kashmiri	Sing.	Singhalese
Mal.	Malayalam	Tam.	Tamil
Mar.	Marathi	Tel.	Telegu
		U.	Urdu

GENERAL INDEX

The General Index is arranged according to the alphabetical order of the names of the drugs and preparations. The Latin names of the drugs and preparations in the monographs with the exception of synonyms, are not included in this Index, because the text of the Pharmacopoeial List is arranged according to the alphabetical order of the Latin names.

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